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Jerry M. Conley, Director

FEDERAL AID IN FISH AND WILDLIFE RESTORATION

Job Performance Report

Project F-71-R-11

REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

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JOB PERFORMANCE REPORT

State of: Idaho

Name: Regional Fishery Management Investigations

Project No.: F-71-R-11

Title: Salmon Subregion Mountain Lake Investigations

Job No.: 6(SAL)-a

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

Sunapee Trout Investigations:

Alice Lake was surveyed for Sunapee trout in 1986. Six male Sunapee trout were collected. Lengths ranged from 230 mm to 280 mm and ages ranged from 3 to 4 years.

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INTRODUCTION

The Sunapee trout, Salvelinus alpinus oquassa, is a rare, artic char that became isolated in a few, deep, coldwater lakes in New England after the last glaciation (Behnke 1984). The preferred habitat of Sunapee trout is a deep, oligotrophic lake. Summer habitat is restricted to the upper limit of the hypolimnion (Newell 1958); maximum depth of habitat is restricted by plankton production within the euphotic zone (Everhart and Waters 1965).

The spawning habitat of Sunapee trout is similar to other artic char (Kircheis 1976). Sunapee trout spawn in the fall from mid-October to mid-November when surface water temperatures drop below 15 C (Carlander 1969; Kircheis 1976; Newell 1958). Males mature at age 2+ and age 3+ and females mature at age 3+ and age 4+. Negatively buoyant eggs are broadcast over rock shoals at depths between 0.3 m to 1.0 m with little or no site preparation (Kircheis 1976). The eggs hatch in 79 to 122 days in water of 3.0 to 11.0 C.

Food habits of adults were thought to be similar to the blueback trout (S. alpinus), which consist primarily of plankton and some aquatic insects and fish (Everhart and Waters 1965).

In 1925, Sunapee trout were introduced into several mountain lakes in what is now the Sawtooth National Recreation Area (SNRA). These fish were forgotten until the late 1970s when Idaho Department of Fish and Game (IDFG) personnel caught and recognized this species in Sawtooth Lake. Examination of old stocking records listed Sawtooth Lake, Alice Lake and five (unknown) other lakes in the Redfish Lake Creek drainage as recipients of Sunapee trout fry. Field trips into Sawtooth and Alice lakes identified the existence of Sunapee trout populations in these two lakes (Ball, IDFG, personal communication). Identification of the "five other lakes" stocked with Sunapee trout has not been completed.

OBJECTIVES

1. To make **a** list of lakes with the potential of containing populations of Sunapee trout.

2. To survey lakes from the above-referenced list for the presence of Sunapee trout.

3. To determine age, length, growth and sex of all Sunapee trout collected.

4. To develop a species management plan for Sunapee trout.

RECOMMENDATIONS

1. To complete evaluation of the five other lakes potentially containing Sunapee trout.

2. To collect liminological and water chemistry data on lakes that contain Sunapee trout.

STUDY AREA

At an elevation of 2,622 m, Alice Lake was surveyed for Sunapee trout in 1986, Twp. 7N., Rge. 13E., Sec. 16, NE1/4NW1/4. It has a surface area of 72.3 hectares; however, maximum and average depths are not known. The lake is classified as oligotrophic, with one inlet originating from Twin Lakes and one outlet flowing into Pettit Lake. Spawning habitat is minimal in the inlet and outlet streams, although there is abundant rock rubble along the shore that appears to be adequate for spawning. In addition to Sunapee trout, Alice Lake supports a population of brook trout (Salvelinus fontinalis).

TECHNIQUES

Alice Lake was surveyed on October 7-8, 1986. Two 38 m experimental mist gill nets were deployed using a one-man inflatable raft. The nets consisted of five 7.6-m panels of varying mesh sizes: 19.0 mm, 24.5 mm, 32.0 mm, 38.0 mm and 51.0 mm. Horizontal sets were made at 1600 hours--with the smallest mesh closest to shore--and retrieved at 1200 hours the next day.

All fish collected were identified for species and sex and then measured for total length. Scales were taken from all Sunapee trout, as described by Nielsen and Johnson (1983). Stomach contents of each Sunapee trout were also examined.

RESULTS AND DISCUSSION

Aside from the occasional fish caught, Sunapee trout are difficult to collect because they inhabit deep water that is inaccessible to most mountain lake anglers. They do not seem to be readily available to the angler during the summer (Ball, IDFG, personal communication). They become vulnerable to gill nets only in the fall when they move into shallow water to spawn. This species of char does not appear to be a good sport fish.

The two gill nets were fished for a combined total of 40 hours. A total of 57 fish were collected: 51 brook trout and 6 Sunapee trout. All Sunapee trout collected were identified as sexually mature males. Total lengths (TL) ranged from 230 mm to 280 mm and ages were 3 and 4 years (Table 1).

Table 1. Length, age and **sex** of Sunapee trout from Alice Lake, 1986.

Length (mm)	Age	Sex
280	4	M
270	4	M
250	3	M
240	3	M
240	4	M
230	3	M

All but one stomach was empty, which contained a single plecopteran.

The low number of Sunapee trout collected could indicate: (1) a small population exists in Alice Lake, or (2) the time of collection did not correspond to the height of spawning activity. The latter hypothesis was the most plausible for two reasons. First, literature states that Sunapee trout spawn from mid-October to mid-November (Newell 1958; Kircheis 1976). Collection in 1986 was conducted in early October. Second, only male Sunapee trout were collected. This behavior is similar to other char, notably brook trout, where males arrive at the spawning habitat before females and protect their territory until spawning is completed (Scott and Crossman 1973).

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JOB PERFORMANCE REPORT

State of: Idaho

Project No.: F-17-R-11

Job. No.: 6(SAL)-b[1]

Name: Regional Fishery Management Investigations

Title: Salmon Subregion Lowland Lake Investigations

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

Williams Lake:

Catch rates for both the ice fishery and opening weekend of the general fishery declined to 0.35 fish/hr and 0.43 fish/hr, respectively. Mean lengths of fish harvested during the ice fishery and general fishery increased to 326 mm and 364 mm, respectively. Spawning ground counts estimated that large numbers of spawners were using Lake Creek.

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INTRODUCTION

Williams Lake, a mesotrophic lake, is located in north-central Lemhi County at 1600 m (5,252 feet) in elevation. The surface area is 72.8 hectares (180 acres). Maximum depth is 56 m (185 feet), with a mean depth of 23 m (75 feet). Formation of the lake occurred approximately 6,000 years ago when **a** landslide, probably triggered by an earthquake, blocked Lake Creek, the main source of water. Additional sources of water include one small spring and several intermittent streams.

Lake access prior to 1951 was by foot or horseback. In 1951, a toll road was constructed and development of the privately owned eastern third of the lake began with a resort, followed by private residences. Because of public demand, in 1968 the U.S. Forest Service built a road into the western two-thirds of the lake contained in the Salmon National Forest.

Rainbow trout (Salmo gairdneri) and bull trout (Salvelinus confluentus) originally occurred in Lake Creek prior to the lake's formation. Declines in mean age and mean length of trout in the lake between 1958 and 1965 was documented (Bjornn 1967) and supplemental stocking of fingerling and catchable rainbow trout was initiated in 1966. Fishing pressure has diminished over the last 15 years. In 1976, a 30-day ice fishery was established in Williams Lake from January 15 to February 15.

In 1979, a stock of spring spawning hatchery rainbow trout from Mt. Whitney Hatchery, California, was introduced into Williams Lake. As a result, a self-sustaining, naturally spawning population has developed. In 1983, Lake Creek was surveyed in May and many large rainbow trout were observed spawning. Lake Creek was closed to fishing until July 1 to protect the extremely vulnerable spawning fish. Large numbers of resultant fry indicated that supplemental stocking of rainbow trout could be discontinued. An investigation was initiated in 1985 to answer the following questions:

1. How much fishing pressure and harvest is occurring in Williams Lake?

2. What effect is this pressure having on the spawning population?

3. Will this population be able to withstand the fishing pressure without the resumption of supplemental stocking?

A creel survey was conducted in 1985 to determine fishing pressure and total harvest (Reingold and Davis 1987). The answers to questions 2 and 3 have yet to be determined. Presently, spawning ground surveys, opening weekend creel checks and monitoring of the ice fishery have been used to evaluate questions 2 and 3.

In recent years, there has been growing concern about the water quality in Williams Lake and how this might affect the fish population. Bjornn (1967) collected data on water chemistry and various limnetic

parameters in Williams Lake. The largest concern that developed was regarding the relatively limited area available to trout. Bjornn reported that most fish were concentrated in the top 9 m (20 feet) of the water column due to low levels of dissolved oxygen found below 9 m. Questions were raised concerning the quantity of summer trout habitat available in Williams Lake and its estimated carrying capacity. This information will be collected in 1987.

Several other questions have been raised concerning the age and length of the spawning population, the age at recruitment and what type of regulations might be necessary to produce a trophy fishery. These questions will be addressed in this and future reports.

OBJECTIVES

To monitor angler use and harvest and evaluate the success of naturally produced fry recruitment to sustain the Williams Lake fishery.

RECOMMENDATIONS

1. Continue to monitor the ice fishery and opening weekend of the general season by collecting data on catch rates, species and total lengths of fish harvested.
2. Determine available summer trout habitat, including limnological and water chemistry data.
3. Determine the age and length of juvenile rainbow trout migrating to the lake.
4. Determine the age and length of fish recruited to the fishery.
5. Determine angler attitudes on various management options, including a trophy fishery in Williams Lake, and write a Williams Lake management plan. _

TECHNIQUES

Creel checks were conducted every weekend on Williams Lake during the ice fishery--January 15 to February 15. The number of anglers, total hours fished and the number and lengths of fish harvested were recorded. Creel checks were also conducted during the opening weekend of the general fishing season. Angler success rates were determined and compared to previous years. Spawning ground counts were made periodically between May 1 to June 16, 1986.

RESULTS AND DISCUSSION

The estimated success rate of Williams Lake ice fishery was 0.35 fish/hr, a decline of 462 from the six-year mean catch rate of 0.65 fish/hr (Table 1). Mean length of harvested fish was 326 mm, reflecting a 122 increase in total length from the six-year mean of 291 mm (Table 1). This general trend extended into the summer season, when the catch rate was 0.43 fish/hr (Table 2). The 1986 catch rate showed a 39% decline from the six-year mean of 0.71 fish/hr. Mean total length of harvested fish was 364 mm, which was an increase of 182 from the six-year mean of 309 mm and a 21% increase over 1985's mean length of 287 mm.

Changes in success rates and mean total lengths were direct responses to the 1984 management change of Williams Lake from a put-and-take fishery to a fishery supported entirely by natural reproduction. Although the number of fish has declined, there has been a corresponding increase in the average length of harvested fish. Historic information indicated that Williams Lake, because of its high productivity, once produced 2 kg rainbow trout. An increase in fishing pressure caused a decline in the fishery, which caused a change in management to a put, grow and take, as well as a put-and-take fishery. Williams Lake has the potential to produce a trophy fishery. Information will be collected in 1987 to help determine the future management of Williams Lake.

Spawning Ground Surveys

Spawning ground surveys were conducted during May and June of 1986 in Lake Creek, the only permanent tributary to Williams Lake (Table 3). The lower 0.8 km (0.5 mi) was surveyed and redds were counted. By mid-June, however, redds were so numerous that superimposition made definition of individual redds impossible. We estimated that several thousand spawners constructed many hundreds of redds along the length of Lake Creek in 1986.

Table 1. Summary of angler interviews for Williams Lake ice fishery, 1981 to 1986.

Year	# Anglers interviewed	Total hours fished	# Fish harvested	Catch rate (fish/hr)	Mean length
1981	148	333.5	114	0.34	284
1982	130	360.5	227	0.63	280
1983	89	275.5	156	1.2	286
1984	95	219.5	207	0.94	280
1985	212	691.0	283	0.41	290
1986	55	93.5	33	0.35	326

Table 2. Opening weekend creel data summary for Williams Lake, 1981 to 1986.

Year	Number of anglers	Hours of effort	t Rainbow harvested	# Bull trout harvested	Catch rate (fish/hr)	Mean length (mm)
1981	401	853.5	656	2	0.77	312
1982	317	822.5	273	8	0.34	333
1983	202	487.5	310	1	0.64	272
1984	204	419.5	499	6	1.2	284
1985	181	510.0	433	2	0.85	287
1986	141	404.0	170	5	0.43	364

Table 3. Lake Creek spawning ground survey summary, 1986.

Date	# Redds	# Spawners
5/02/86	15	50
5/08/86	27	60
5/21/86	35	10
5/29/86	Lake Creek high & muddy	--
6/09/86	superimposition	100
6/19/86	superimposition	150

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JOB PERFORMANCE REPORT

State of: Idaho

Project No.: F-71-R-11

Job No.: 6(SAL)-b^2

Name: Regional Fishery Management Investigations

Title: Salmon Subregion Lowland Lakes Investigations

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

Stanley Basin Lakes Creel Survey:

A creel survey was conducted on Redfish, Alturas and Stanley lakes between May 24 and September 1, 1986. The estimated total angler hours on Redfish Lake was 15,449 hours. The estimated total number of fish caught was 8,524 (14 fish/hectare). The rate of return to the creel for hatchery rainbow trout catchables was 17%. The catch rate for hatchery rainbow trout was 0.4 fish/hr. The overall catch rate was 0.6 fish/hr. The mean length of a fishing trip was 1.9 hours.

The estimated total number of angler hours on Stanley Lake was 11,326. Mean length of a fishing trip was 3.6 hours. Estimated number of fish caught was 9,303 (129 fish/hectare). The catch rate was 0.8 fish/hr. Hatchery rainbow trout contributed 4,408 fish to the harvest for a return rate of 33%. All lake trout collected from Stanley Lake were 10+ years of age. There appears to be no successful spawning of lake trout.

Overall catch rate in Alturas Lake was 0.8 fish/hr. Estimated total angler hours was 12,577. Mean length of a fish trip was 1.6 hours. The estimated total number of fish caught was 10,705 (22 fish/hectare). Return rate for catchable rainbow trout was 39%. An estimated 7,790 rainbow were harvested.

Catch rates for Little Redfish, Pettit and Perkins lakes were 0.3, 1.3 and 0.3 fish/hr, respectively.

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INTRODUCTION

Sawtooth Valley, the headwaters of the Salmon River, contains several large glacier moraine lakes--Alturas, Redfish, Stanley, Yellowbelly and Pettit, as well as two smaller lakes--Perkins and Little Redfish (Fig. 1). Surface areas range from 19 to 628 hectares and maximum depths range from 8 to 89 m (Table 1). Classified as oligotrophic, the lakes are relatively unproductive, but support coldwater game and nongame fish populations (Table 2). Located at the base of the picturesque Sawtooth Mountain Range, these lakes are contained within the boundaries of the Sawtooth National Recreation Area (SNRA), which has recorded over 1,000,000 recreation visitor days (RVDs) each year for the last seven years. Fishing in streams and lakes accounted for 78% of the Wildlife and Fisheries User Days in 1985 and 1986 (Steve Lipis, USFS, personal communication).

Between 1963 to 1966, research conducted on Stanley, Redfish and Alturas lakes included creel surveys, rainbow trout (Salmo garidneri) strain evaluation and fish species composition (Bjornn and Corley 1965; Corley 1965 and 1968). Pettit, Yellowbelly and Stanley lakes were reclaimed to remove nongame fish. "Squoxin" was used in Perkins Lake to remove northern squawfish (Ptychocheilus oregonensis). Since that time, most work has involved an occasional gill net set and angler creel checks. Timely data on fishing pressure, numbers of fish harvested and percent return to creel of hatchery rainbow trout is needed. In 1986, a study was initiated to collect and update this information.

OBJECTIVES

1. To collect creel data to estimate total fishing pressure, total harvest, catch rates and percent return to the creel for hatchery rainbow trout in Alturas, Redfish and Stanley lakes.

2. To determine catch rates and harvest composition in Pettit, Perkins and Little Redfish lakes.

3. To assess angler attitudes toward power boat recreation on Redfish Lake.

4. To determine the lake trout (Salvelinus namaycush) population status in Stanley Lake.

5. To determine fish species composition in each lake.

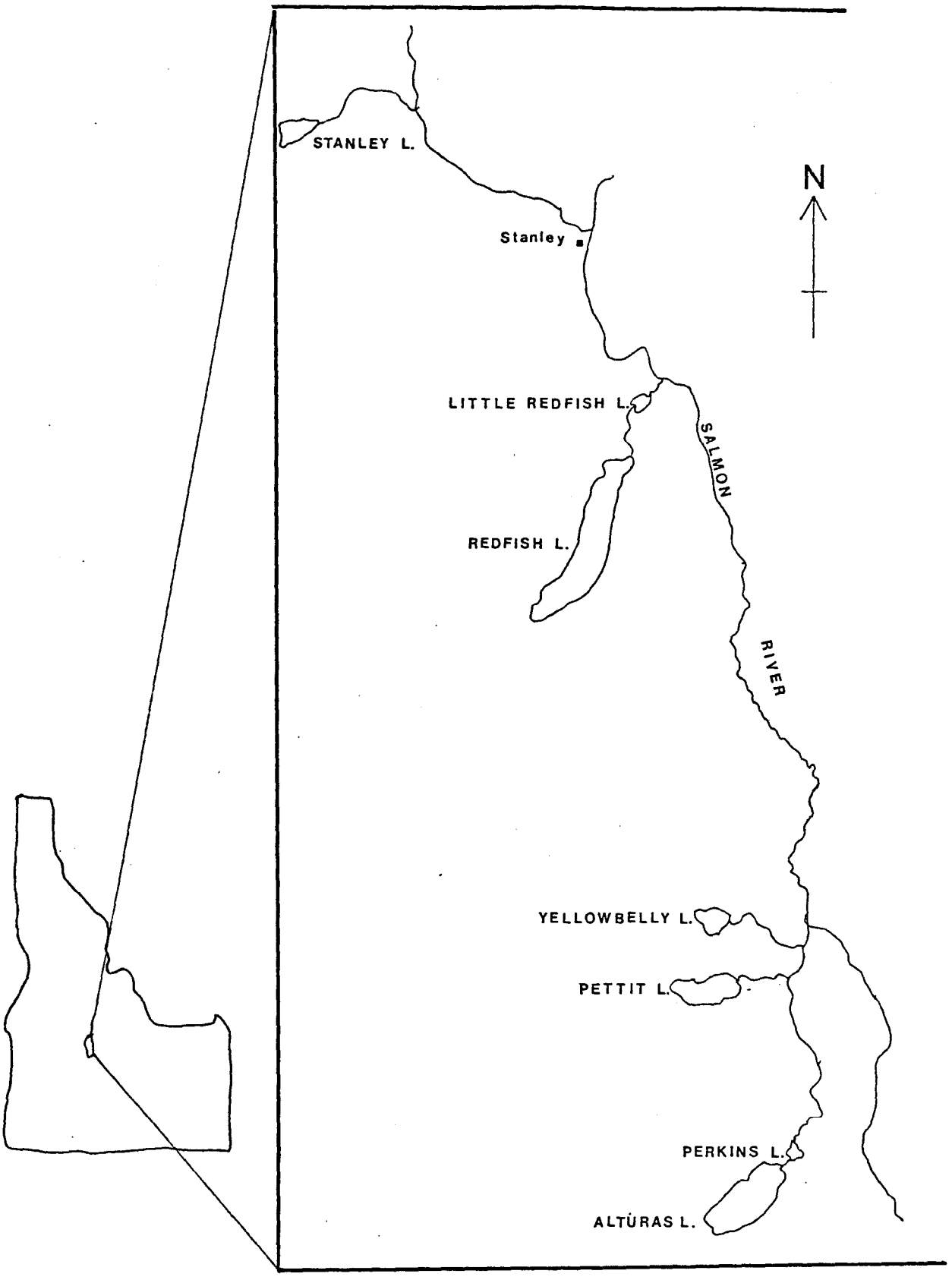

Figure 1. Sawtooth Valley lakes in the Sawtooth National Recreational Area.

Table 1. Description of physical parameters of Sawtooth Valley lakes.

Lake	Surface area (ha)	Maximum depth (m)	Mean depth (m)
Redfish	608	89.0	46
Alturas	339	67.0	38
Pettit	158	61.0	23
Stanley	74	27.0	15
Yellowbelly	76	23.0	-
Little Redfish	26	7.6	-
Perkins	21	9.4	-

Table 2. List of game fish found in Sawtooth Valley lakes.

Game fish	Lake(s)
Rainbow trout	Stocked in all lakes, except Yellowbelly.
Cutthroat trout	Yellowbelly, Alturas
Brook trout	Stanley, Pettit, Alturas
Lake trout	Stanley
Bull trout	Redfish, Little Redfish, Alturas, Perkins, Stanley
Kokanee salmon	Stanley, Alturas, Pettit, Redfish
Sockeye salmon	Redfish
Whitefish	Redfish, Alturas, Perkins

RECOMMENDATIONS

1. Reduce number of catchable rainbow trout planted in Redfish Lake from 30,000 to 20,000.

2. Collect information regarding age, reproduction and food habits of lake trout in Stanley Lake.

3. Determine summer trout habitat in Stanley Lake.

4. Reduce number of catchable rainbow trout planted in Alturas Lake from 20,000 to 15,000.

5. Increase number of catchables planted in Little Redfish Lake from 3,000 to 6,000.

6. Plant 10,000 rainbow trout and cutthroat trout fry in Yellowbelly Lake in 1987.

TECHNIQUES

Creel Survey

A creel survey was conducted on Redfish, Stanley and Alturas lakes between May 24 and September 1, 1986. The season was divided into eight 14-day periods, during which two randomly chosen weekdays and alternating weekend days were surveyed. Instantaneous angler counts were made four times each survey day. Starting times varied between 0600 to 0900 on the hour. Each additional count was made every 3.25 hours in May, June and August and every 3.5 hours in July, based on the number of daylight hours.

Angler interviews were conducted between count times. Information collected included number of boat anglers/party, number of shore anglers, number of hours fished, number of completed trips, state of residence, number of fish kept and released and total fish caught. Number of each species of fish kept was recorded and rainbow trout were defined as wild or hatchery. Total length of each fish checked was also recorded. Each angler was asked to rate the fishery (excellent, good, fair, or poor). At Redfish Lake, anglers were asked three additional questions:

1. Are you camped at Redfish Lake today?

2. Do the power boat activities reduce the quality of your fishing experience?

3. Would you fish at Little Redfish Lake instead of Redfish Lake if the fishing were better?

Total fishing pressure was determined separately for shore anglers and boat anglers on a monthly basis. Each monthly total was added for a season total. Instantaneous counts were used to calculate mean number of boats and shore anglers/hr. Mean number of anglers/boat was determined from angler interviews and multiplied by mean number of boats/hr to obtain the mean number of boat anglers/hr. This average and the average number of shore anglers/hr were multiplied by day length for that month as determined from sunrise and sunset tables. This value is the average number of angler hours for boat anglers and shore anglers/day. These values were then multiplied by the number of days in the month to estimate the total monthly fishing pressure for boat and shore anglers. Catch rates were used to calculate the estimated total number of fish caught and fish harvested for each species of game fish by multiplying the total hours by catch rate. All monthly totals were combined for a season total.

Species Composition

Each of the Stanley Basin lakes was sampled for fish species composition using two gill nets 38 m long and 2 m high. Each gill net consisted of five panels, 7.6m long. Each panel was one mesh size ranging from 19 mm to 64 mm. All sets were made late in the evening and retrieved the following morning. The nets were set horizontal and perpendicular to the shoreline, with the smallest mesh panel closest to shore. Lengths of all game fish were recorded and nongame fish were counted.

RESULTS AND DISCUSSION

Creel Survey

Redfish Lake

During 1986, 1,008 anglers were interviewed (Table 3). They had fished for 1,585 hours and caught 899 fish (14 fish/hectare) for a catch rate of 0.6 fish/hr. The Fisheries Management Plan goal for these lakes is 0.5 fish/hr. Total fish caught include fish harvested (76%) and fish released (24%). The overall catch rate for harvested rainbow trout was 0.4 fish/hr, bull trout (Salvelinus confluentus) was 0.01 fish/hr and 0.06 fish/hr for kokanee salmon (Oncorhynchus nerka kennerli) (Table 3). Eighty-five percent of the harvested fish were hatchery rainbow trout catchables and 17% were kokanee salmon and 4Z were bull trout.

The estimated total angler hours expanded from instantaneous counts was 15,449 hours for the period of May 24, to September 1 ,1986 (Table 4). The estimated total number of fish caught was 8,524 fish. Of this number, anglers harvested an estimated 202 bull trout, 921 kokanee salmon and 5,173 catchable rainbow trout (Table 4). Most of the fishing pressure occurred in July and the largest harvest was in June (Table 4).

Table 3. Redfish Lake creel survey data summary, 1986. C/R = catch rate (fish/hour).

# Shore		# Boat	Total	# Fish	# Fish	Total fish caught		Wild rainbow		Hatchery rainbow		Brook trout		Bull trout		Kokanee salmon	
Month	anglers	anglers	hours	kept	released	#	C/R	#	C/R	#	C/R	#	C/R	#	C/R	#	C/R
May	107	93	319	197	86	283	0.9	0	–	174	0.5	0	–	20	0.06	3	0.009
June	129	95	393	153	39	192	0.5	0	–	120	0.3	0	–	3	0.007	30	0.08
July	241	160	623	254	75	329	0.5	0	–	194	0.3	0	–	3	0.005	57	0.09
August	78	95	240	81	12	93	0.4	0	–	77	0.3	0	–	0	–	4	0.02
September	4	6	10	2	0	2	0.2	0	–	2	0.2			–	0.0	0	0.00
Totals	559	449	1,585	687	212	899	0.6	0		567	0.4	0		26	0.01	94	0.06
Percentage of totals			76%	24%													

Table 4. Redfish Lake estimated total hours and total fish caught, 1986.

Month		Mean boats/ hour	Mean anglers/ boat	Mean anglers/ hour	Day Length	Total hours/ day	No. of days	Total hours/ month	Total fish caught	Total hatchery	Total brook trout	Total bull trout	Total kokanee salmon
May:	Boat	4.2	2.9	12.0	15	180	8	1,440	1,296	720	0	86	13
	Shore			6.4	15	96	8	768	961	481	0	58	9
June:	Boat	3.1	2.2	6.8	16	109	30	3,270	1,635	981	0	23	262
	Shore			2.6	16	42	30	1,260	630	378	0	9	101
July:	Boat	3.8	2.3	8.7	15	131	31	4,061	2,031	1,218	0	20	365
	Shore			2.4	15	36	31	1,116	558	335	0	6	100
Aug.:	Boat	2.8	2.1	5.9	14	83	31	2,573	1,029	772	0	0	52
	Shore			2.2	14	31	31	961	384	288	0	0	19
Total:	Boat							11,344	5,991	3,691	0	129	692
	Shore							4,105	2,533	1,482	0	73	229
Grand Total								15,449	8,524	5,173	0	202	921

The overall catch rate on Redfish Lake in 1986 (0.6 fish/hr) did not vary significantly from the catch rate in 1966 (0.8 fish/hr) (Corley 1966). Number of rainbow trout stocked in Redfish was about the same (31,500 and 30,105 in 1966 and 1986, respectively). In 1986, an estimated 5,173 rainbow trout were harvested for a 17% return rate--an unacceptable value from an economic point of view. The average cost to raise rainbow trout to catchable size in Idaho is 50 cents/fish. At the present rate of return, the cost/fish returned to the creel was $2.90/fish. Methods to improve the return rate include: increasing fishing pressure, reducing the number of fish stocked and improving distribution. Presently, fish are stocked once/month and access points are limited. Therefore, a more frequent stocking pattern may improve return rates. Reducing the number of catchable rainbow trout planted in Redfish Lake may be the easiest to manipulate and may increase the rate of return, but it could also reduce the overall catch rate. Reduction in numbers of fish stocked must be adjusted to obtain the highest return to the creel and yet maintain the present level of angler success.

Anglers were asked to subjectively evaluate the fishery. Of a total of 390 angler party responses, 72% thought the fishery at Redfish Lake was fair or better (excellent 5%, good 27%, fair 40% and poor 28%). Three additional questions were asked of anglers fishing at Redfish Lake to ascertain angler attitudes toward power boats and whether they would fish at Little Redfish Lake if the fishing were to improve. The results are summarized in Table 5. Seventy-eight percent of the anglers interviewed felt that power boats disrupted their fishing experience and 62% of these anglers said they would fish at Little Redfish Lake. Evidently, the scenic qualities of Redfish Lake outweigh some of the undesirable effects of loud power boats for some anglers. For those anglers that find the power boats offensive, an attempt to improve the fishery at Little Redfish Lake will be made in 1987.

Table 5. Angler preference summary.

Question 1. Are you camped at big Redfish Lake today?

Number	% Yes	% No
348	75	25

Question 2. Do power boat activities reduce the quality of your fishing experience?

Number	% Yes	% No
246	78	22

Question 3. Would you fish at Little Redfish Lake instead of Redfish Lake if the fishing were better?

Number	% Yes	% No
188	65	35

Stanley Lake

A creel survey conducted from May 24 to September 1, 1986 on Stanley Lake interviewed 1,037 anglers; they had fished a total of 1,465 hours and caught 1,184 fish (129 fish/hectare) for a catch rate of 0.8 fish/hr, exceeding the stated goal of 0.7 fish/hr in the Fisheries Management Plan (Table 6). Fish released accounted for 36% of the total fish caught and 64% were harvested. Catch rates for hatchery rainbow trout, kokanee salmon, brook trout (Salvelinus fontinalis), bull trout, wild rainbow trout and lake trout are listed in Table 6. Hatchery rainbow trout comprised 72% of the fish harvested, kokanee salmon provided 19% of the harvest and 7% of the harvest was brook trout.

Estimated total angler hours was 11,326 with July the busiest month, followed by August and June (Table 7). An estimated 9,303 fish were caught. June had the highest catch rate at 1.7 fish/hr, followed by May, August and July (Table 6). Hatchery rainbow trout contributed an estimated 4,408 fish to the harvest, kokanee salmon was second highest with 994 fish and brook trout was third highest with 465 fish. In 1986, 13,250 catchable rainbow trout were planted in Stanley Lake. An estimated 33X were harvested by anglers. The cost/fish returned to the creel was approximately $1.50 each.

Total catch rates in 1963 and 1966 were the same as in 1986 (0.8 fish/hr). Hatchery rainbow trout contributed 78% and 94% of the catch in 1963 and 1964, respectively (Corley 1965, 1966). Kokanee salmon have varied in contribution to the fishery (16%, 5% and 19% in 1963, 1968 and 1986, respectively). The brook trout harvest component has varied similarly (5%, 0.9% and 7% in 1963, 1968 and 1986, respectively).

Stanley Lake provides a unique fishing opportunity in the area. In 1975, 15,000 lake trout fingerlings were planted in Stanley Lake. In 1986, an estimated 14 lake trout were harvested. The mean length of all lake trout sampled in both the harvest and sampling with gill nets was 680 mm. It is unknown whether these fish are reproducing successfully in Stanley Lake. Scale analysis indicated that all fish examined were 10+ years of age, which corresponds to the age of the original plant in 1975. The lack of small lake trout in the harvest and gill nets are indicators that no successful natural reproduction of lake trout occurs in Stanley Lake. Lake trout mature sexually when they reach a total length of 330 to 375 mm (approximately 5 years of age) and can live for 20 years or longer (Carlander 1969). To provide a continuous trophy lake trout fishery in Stanley Lake, additional plants of fingerlings appear necessary.

Anglers were asked to evaluate the Stanley Lake fishery (excellent, good, fair, or poor). Over 6% of the 502 angler parties responding considered the fishery as fair or better (4% excellent, 20% good, 45% fair and 31% poor).

Table 6. Stanley Lake creel survey data summary, 1986. C/R = catch rate (fish/hour).

Month	# Shore anglers	# Boat anglers	Total hours	# Fish kept	# Fish released	Total fish caught #	Total fish caught C/R	Wild rainbow #	Wild rainbow C✓R	Hatchery rainbow #	Hatchery rainbow C/R	Brook trout #	Brook trout C/R	Bull trout #	Bull trout C✓R	Lake trout #	Lake trout C/R	Kokanee salmon #	Kokanee salmon C/R
May	113	38	228	112	69	181	0.8	2	0.009	104	0.5	0	–	0	–	1	0.004	5	0.02
June	133	66	297	258	248	506	1.7	0	–	157	0.5	26	0.09	2	0.007	1	0.003	72	0.2
July	345	140	656	242	83	325	0.5	0	–	159	0.2	16	0.02	1	0.002	0	-	66	0.1
August	149	53	284	148	24	172	0.6	0	–	129	0.5	14	0.05	0	–	0	–	5	0.02
Total	740	297	1,465	760	424	1,184	0.8	2	0.001	549	0.4	56	0.04	3	0.002	2	0.001	148	0.1

Table 7. Stanley Lake estimated total hours and total fish caught, 1986.

Month		Mean boats/ hour	Mean anglers/ boat	Mean anglers/ hour	Day length	Total hours/ day	No. of days	Total hours/ month	Total fish caught	Total wild rainbow	Total hatchery rainbow	Total brook trout	Total bull trout	Total lake trout	Total kokanee salmon
May	Boat	2.8	2.1	5.9	15	89	8	712	570	6	356	0	0	3	14
	Shore			5.9	15	89	8	712	570	6	356	0	0	3	14
June	Boat	1.3	1.9	2.5	16	40	30	1,200	2,040	0	600	108	8	4	240
	Shore			2.5	16	40	30	1,200	2,040	0	600	108	8	4	240
July	Boat	1.9	2.1	4.0	15	60	31	1,860	930	0	372	37	4	0	186
	Shore			5.0	15	75	31	2,325	1,163	0	465	47	5	0	233
Aug.	Boat	2.1	2.0	4.2	14	59	31	1,829	1,097	0	915	91	0	0	37
	Shore			3.4	14	48	31	1,488	893	0	744	74	0	0	30
Total	Boat							5,601	4,637	6	2,243	236	12	7	477
	Shore							5,725	4,666	6	2,165	229	13	7	517
Grand Total								11,326	9,303	12	4,408	465	25	14	994

Alturas Lake

Between May 24 and September 1, 1986, 919 anglers were interviewed that fished for 1,206 hours and caught 989 fish (22 fish/hectare) for a catch rate of 0.8 fish/hr, which is higher than the 0.7 fish/hr goal in the Fisheries Management Plan (Table 8). Hatchery rainbow trout provided a catch rate of 0.6 fish/hr. Catch rates for bull trout, brook trout, kokanee salmon, wild rainbow and cutthroat trout (Salmo clarki) are listed in Table 8. Approximately 94Z of the harvest was hatchery rainbow trout and 3Z, 0.8X, 0.8Z and 0.6% of the harvested fish were bull trout, brook trout, kokanee salmon and wild rainbow trout, respectively. In 1963, bull trout and brook trout each provided 1Z of the catch and kokanee salmon provided 32Z of the harvest. It appears that the decrease in the number of kokanee salmon since 1963 in Alturas Lake is too prolonged to be attributed to natural population fluctuations and needs further investigation.

The estimated total angler hours on Alturas Lake was 12,577 hours (Table 9). Estimated total number of fish caught between May 24 and September 1, 1986 was 10,705. Anglers harvested an estimated 3 cutthroat trout, 40 brook trout, 49 wild rainbow trout, 64 kokanee salmon, 212 bull trout and 7,790 hatchery rainbow trout for a total of 8,158 fish (Table 9). Over 20,000 catchables were planted and 7,790 were harvested for a return rate of 39% to the creel and an approximate cost of $1.28/fish. The highest fishing pressure and harvest occurred during the month of July, followed by August and June (Table 9). In 1986, 50% of the fish were stocked by the end of June and 50Z were stocked by the end of July. I believe that dividing the same number, or fewer catchables into more release dates could improve percent return to creel.

During 1962, 1963 and 1964, creel surveys were conducted on Alturas Lake; catch rates were 0.8, 0.8 and 1.0 fish/hr, respectively (Corley 1968; Bjornn and Corley 1965). These catch rates did not change in 1986 (0.8 fish/hr). There was a 60Z decrease in the estimated total fishing hours from 31,713 in 1963 to 12,577 in 1986. Overall percent catchable trout returned to the creel in 1963 was 49Z. In 1986, the percent return was 39Z (7,790 catchables harvested and 20,050 catchables stocked). The 20Z decline in percent return to creel was probably due to the reduction in fishing pressure as well as stocking procedures.

When anglers were asked to subjectively rate the fishery at Alturas Lake, 63% of the anglers responding rated the fishery as fair or better (2% excellent, 16% good, 55% fair and 27% poor).

Little Redfish Lake

Creel checks were conducted on Little Redfish Lake on 4 different days. Twenty-four anglers had fished for 15.4 hours and caught 4 fish (catchables) for a catch rate of 0.3 fish/hr. The low catch rate is attributed to the one stocking date in late May, the low number of fish planted and low fishing pressure. Stocking during June and July should improve return to the creel and catch rate.

Table 8. Alturas Lake creel survey data summary, 1986. C/R = catch rate (fish/hour).

Month	# Shore anglers	# Boat anglers	Total hours	# Fish kept	# Fish released	Total fish caught		Wild rainbow		Hatchery rainbow		Brook trout		Bull trout		Cutthroat trout		Kokanee salmon	
						#	C/R	#	C/R	#	C/R	#	C/R	#	C/R	#	C/R	#	C/R
May	39	10	72	2	4	6	0.08	0		0	–	0	–	1	0.01	1	0.01	0	
June	223	73	347	145	58	203	0.6	0		121	0.3	5	0.01	18	0.05	0	–	1	0.003
July	428	72	537	481	157	632	1.2	5	0.009	467	0.9	1	0.002	5	0.009	0	–	4	0.007
August	20B	50	237	113	24	137	0.6	0	–	111	0.5	0	–	1	0.004	0	–	1	0.004
September	21	0	13	9	2	11	0.8	0	–	9	0.7	0	–	0	–	0	–	0	–
Total	919	205	1,206	750	245	989	0.8	5	0.004	708	0.6	6	0.005	25	0.02	1	0.001	6	0.005

Table 9. Alturas Lake estimated total hours and total fish caught, 1986.

Month		Mean boats/ hour	Mean anglers/ boat	Mean anglers/ hour	Day length	Total hours/ day	No. of days	Total hours/ month	Total fish caught	Total wild rainbow	Total hatchery rainbow	Total brook trout	Total bull trout	Total cutthroat trout	Total kokanee salmon
May	Boat	0.4	2.5	1.0	15	15	8	120	10	0	0	0	1	1	0
	Shore			1.4	15	21	8	168	13	0	0	0	2	2	0
June	Boat	1.3	2.3	3.0	16	48	30	1,440	864	0	432	14	72	0	4
	Shore			3.0	16	48	30	1,440	864	0	432	14	72	0	4
July	Boat	2.0	2.4	4.8	15	72	31	2,232	2,678	20	2,009	4	20	0	17
	Shore			7.0	15	105	31	3,255	3,906	29	2,930	8	29	0	23
Aug.	Boat	1.5	3.4	5.1	14	71	31	2,201	1,321	0	1,101	0	9	0	9
	Shore			3.8	14	53	31	1,643	986	0	827	0	7	0	7
Sept.	Boat	1.0	2.0	2.0	13	26	1	26	21	0	23	0	0	0	0
	Shore			4.0	13	52	1	52	42	0	36	0	0	0	0
Total	Boat							6,019	4,894	20	3,565	18	102	1	30
	Shore							6,558	5,811	29	4,225	22	110	2	34
Grand Total								12,577	10,705	49	7,790	40	212	3	64

Pettit Lake

Creel checks were performed on four days throughout the summer and 36 anglers were contacted. They spent 68 hours fishing and caught 91 fish for a catch rate of 1.3 fish/hr. Wild and hatchery rainbow trout, brook trout, bull trout and kokanee salmon were harvested.

Perkins Lake

Perkins Lake was surveyed on three occasions and 17 anglers were interviewed. They spent 22 hours fishing and caught 7 fish for a catch rate of 0.3 fish/hr.

Species Composition

Species composition was determined by gill nets and harvest information.

Redfish Lake

Redfish Lake was fished with gill nets on June 3 and June 28, 1986. Results of the survey are listed in Appendix A. Gill net surveys indicated that rainbow trout, bull trout, whitefish (Prosopium williamsoni), redside shiners (Richardsonius balteatus), squawfish and suckers were present. Nongame fish species accounted for 61% of the gill net survey. Kokanee salmon are also present in the lake, but were not collected by gill nets.

Stanley Lake

Stanley Lake was surveyed on June 3 and October 9, 1986. Species collected were rainbow trout, kokanee salmon and lake trout (Appendix A). No nongame fish were collected. Brook trout were also present in the lake, but not collected by gill nets.

Alturas Lake

Alturas Lake was sampled on June 4, 13 and 29, 1986. Hatchery rainbow trout, bull trout and whitefish were the only game fish collected by gill nets. Nongame fish species comprised 87% of the gill net catch. However, brook trout, kokanee salmon and cutthroat trout are also present in the lake.

Pettit Lake

Pettit Lake was surveyed on June 11, 1986. Hatchery rainbow, brook trout and kokanee salmon were collected (Appendix A). Forty-four percent of the catch were nongame fish, composed of redside shiners and squawfish.

Perkins Lake

Perkins Lake was sampled on June 12, 1986. Bull trout, whitefish, suckers and squawfish were collected, but 87% were nongame fish. Hatchery rainbow trout were also present in the lake.

Little Redfish Lake

Little Redfish Lake was sampled on June 10, 1986. Rainbow trout and bull trout were the only game fish collected. Suckers and squawfish comprised 87Z of the fish collected.

Yellowbelly Lake

Yellowbelly Lake was sampled on June 23, 1986. The only game fish collected was brook trout (Appendix A). Nongame fish contributed 87% of the fish collected. Approximately 10,000 westslope cutthroat trout fry were stocked in August.

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JOB PERFORMANCE REPORT

State of: Idaho

Name: Regional Fishery Management Investigations

Project No.: F-17-R-11

Title: Salmon Subregion Rivers and Streams Investigations

Job No.: 6(SAL)-c

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

Juvenile Salmonid Densities:
Middle Fork Salmon River
Main Stem Salmon River Tributaries

Two trips down the Middle Fork Salmon River (MFSR) were taken--one in mid-July and one in late August--to determine the best time for collecting densities of cutthroat trout, juvenile steelhead and juvenile chinook salmon. Mean densities for cutthroat trout remained the same in July and August. Mean juvenile steelhead densities declined in August by 71%. Mean juvenile chinook salmon densities increased by 2,650% due to downstream movement of juvenile chinook from headwater streams to overwintering habitats in the MFSR.

The July 1986 mean cutthroat densities increased by 109% over July 1985 densities and was attributed to an increase in the area sampled and normal population fluctuations. Mean juvenile steelhead densities were not significantly different.

Mean juvenile steelhead densities in 1986 for MFSR tributaries increased by 67% over 1985 densities. Juvenile chinook salmon densities increased by 88% over 1985 values. Total numbers of cutthroat were similar.

Mean juvenile steelhead densities in the main stem Salmon River tributaries increased by 27% in 1986 over 1985 densities. A total of three chinook salmon were counted in 1986 and none were counted in 1985.

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INTRODUCTION

The Middle Fork Salmon River (MFSR), part of the Wild and Scenic Rivers System, flows through a remote area in central Idaho. Most of its length is contained within the Frank Church River of No Return Wilderness Area. The headwaters of the Middle Fork originate at the confluence of Bear Valley and Marsh creeks near Cape Horn Mountain. The river flows north 171 km to its confluence with the main stem Salmon River 92 km below Salmon, Idaho (Fig. 1).

Road access exists to Dagger Falls and at the confluence with the Salmon River. A few of the tributaries' headwaters are accessible via primitive roads. The lower 156 km of the Middle Fork is accessible only by air, float craft, or trail. The MFSR is a major recreational stream that offers a wide variety of outdoor and backcountry opportunities. The number of people floating the river has increased by 179% since 1973 (8,500 in 1986).

In 1971, a study was initiated to monitor the westslope cutthroat trout (Salmo clarki lewisi) population in the MFSR and the following year (1972), a catch-and-release regulation was established in the Middle Fork. Similar regulations were enacted on major tributaries in the early and mid-1980s.

Snorkel transects were established and surveyed annually to monitor the cutthroat trout population (Corley 1972; Jeppson and Ball 1977, 1979). In 1981, a wild steelhead trout (Salmo gairdneri) project was initiated on the Middle Fork (Thurow 1982, 1983, 1985). Beginning in 1985, another study was initiated to determine juvenile steelhead and chinook salmon (0. tshawytscha) densities in the Middle Fork and its tributaries.

This report discusses data collected in July 1986 and August 1986 pertaining to cutthroat trout, juvenile steelhead and chinook salmon densities in the Middle Fork and five tributaries of the Salmon River downstream of the Middle Fork.

OBJECTIVES

1. To monitor juvenile steelhead and chinook salmon densities within the Middle Fork, its tributaries and Salmon River tributaries.

2. To monitor the effects of catch-and-release regulations on cutthroat, rainbow and bull trout (Salvelinus confluentus) populations.

3. To evaluate the best time (month) to collect data on salmonid densities

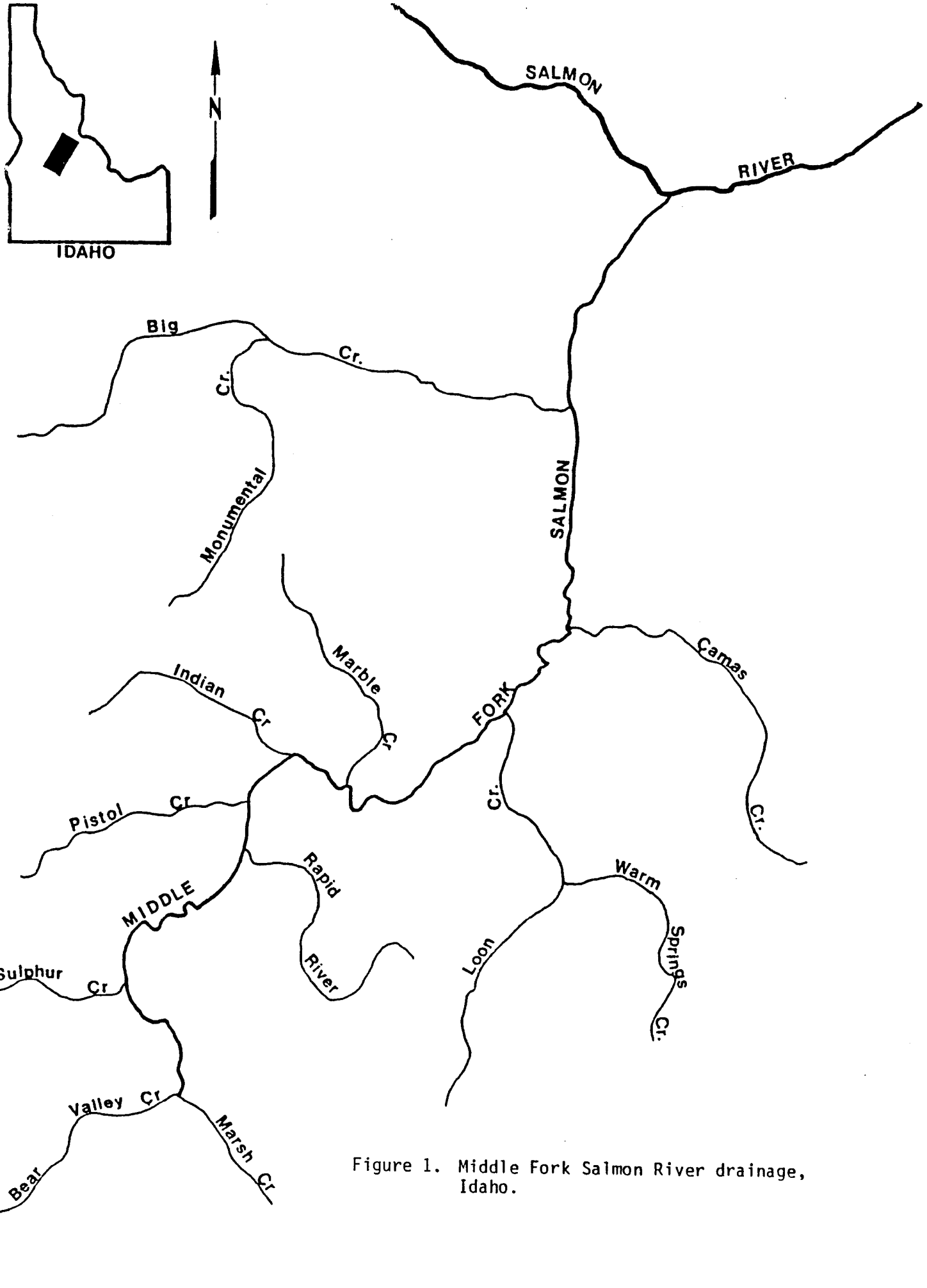

Figure 1. Middle Fork Salmon River drainage, Idaho.

RECOMMENDATIONS

1. Monitor densities of juvenile steelhead, cutthroat trout and chinook salmon in the MFSR via snorkeling.

TECHNIQUES

In 1986, a total of 29 snorkel transects (Appendices C and D) were surveyed on the MFSR (Table 1), 7 transects on five Middle Fork tributaries (Table 2) and 10 transects on five Salmon River tributaries (Table 3). Transects on the Middle Fork were selected specifically for individual species. For example, cutthroat trout-chinook salmon transects included pools and steelhead trout transects included runs and pocket waters. These transects were selected from those already established in either 1971 or 1981 wherever possible (Table 1). The transects located on the tributaries of the Middle Fork and Salmon rivers contained a representative sample of the habitats in the streams.

In 1981, steelhead transects were established at a river gauge reading of 2.85 feet on the Middle Fork Lodge measuring device. It was felt that to retain consistency of habitat, subsequent snorkel surveys should be conducted at this same flow. However, to ensure that data collected would be comparable to similar information being collected basinwide in the Columbia River system, a "biological window" of July 15 to August 30 was established. It was agreed that this time period should encompass stable summer rearing densities for steelhead and chinook salmon. In most years, the 2.85 foot river level and the July 15 to August 30 period coincide. However, in some low water years, the river level of 2.85 feet occurs prior to July 15, such as in 1985 (July 12). It was therefore determined that the time period would take precedence over river level. This year, it was decided to evaluate a mid-July sampling date and a late-August sampling date. In July, all transects were surveyed; in August, only main stem transects from Indian Creek downstream were surveyed.

The area snorkeled in all tributary transects was determined by measuring the length of the transect surveyed and calculating the mean width, based on stream widths measured each 10 m within the surveyed transect. The Middle Fork snorkel transect areas were determined by measuring the visible corridor. Underwater visibility was determined in each transect by submerging a gray, metal, steelhead parr silhouette 200 mm in length and measuring the maximum distance at which it could be seen when stationary. This distance was then doubled because the diver counted fish on both sides to calculate the width of the corridor. This method was similar to the one described by Johnson (1985). In the large pool transects, two divers were used and thus the distance the metal parr was visible was quadrupled.

Table 1. Middle Fork snorkel transects, 1986.

Type	Transect name	SH #[a]	CT #[b]
SH	Boundary	1	
Ct/Ck	Gardell's Hole		A[c]
Ct/Ck	Velvet		B[c]
SH	Elkhorn	3	
SH	Sheepeater	4	
Ct/Ck	Greyhound		C[c]
SH	Rapid River	5	
SH	Indian	6	
Ct/Ck	Pungo		1
Ct/Ck	Marble Pool		3
SH	Ski-jump	7	
Ct/Ck	Lower Jackass		5
SH	Cougar	9	
Ct/Ck	Whitey Cox		7
SH	Rock Island	10	
Ct/Ck	Hospital Pool		9
SH	Hospital Run	11	
Ct/Ck	Tappan Pool		10
SH	Lower Tappan Run	12	
Ct/Ck	Flying B		11
SH	Airstrip	14	
SH	Survey	16	
Ct/Ck	Big Creek Bridge		15
SH	Love Bar	17	
Ct/Ck	Ship Island		17
SH	Little Ouzel	19	
Ct/Ck	Otter Bar		19
Ct/Ck	Goat Creek Pool		21
SH	Goat Creek Run	20	

[a]Numbers correspond to 1982 transects.
[b]Numbers correspond to 1971 transects.
[c]Established 1985.

Table 2. Middle Fork tributary transects, 1986.

Transect Name	Description
Pistol Creek #1	At mile marker 16
Pistol Creek #3	Above mile marker 16
Marble Creek mouth	Above pack bridge
Loon Creek Bridge	Below pack bridge
Loon Creek Run	400 yards above pack bridge
Camas Creek mouth	From pack bridge downstream
Big Creek mouth	400 yards above mouth

Table 3. Main stem Salmon River tributary transects, 1986.

Transect name	Description
Horse Creek Bridge	50 yards above bridge
Horse Creek #2	150 yards above bridge
Chamberlain Creek mouth	400 yards above mouth
Chamberlain Creek run	500 yards above mouth
Bargamin Creek #1	1/4 mile above mouth
Bargamin Creek #2	At trail flat above #1
Sheep Creek #1	Below pack bridge
Sheep Creek #2	300 yards above pack bridge
Pahsimeroi River Dowton Lane	Run above + pool below Dowton Bridge
Pahsimeroi River Lower	100 yards below Dowton Lane Bridge

In the tributary transects, one or two divers would make one pass upstream and count all fish observed. In Middle Fork transects, one or two divers would float downstream and count all fish observed. Fish observed were separated into species and the following length groups: <75 mm, 76 mm to 150 mm, 151 mm to 225 mm, 226 mm to 300 mm and >300 mm. Densities were calculated for fish/100 m and fish/100 m^2. Mean lengths of fish sampled via hook and line were calculated for all species. Changes in area/densities (fish/100 m^2) were evalutated using a paired statistic test for each transect with data between years (1985 vs. 1986) and between months (July vs. August). The null hypothesis was densities between years or months were the same with α= .05.

RESULTS

Middle Fork Salmon River Transects

In 1986, two field trips were taken to survey the MFSR transects. The first trip was taken in mid-July (15 to 22) and the second was taken in late August (20 to 25). All transects were surveyed in July, including the tributary transects. In August, only main stem transects were surveyed--beginning at Indian Creek because low water levels prevented the survey from starting upstream at Boundary Creek. The total number of cutthroat trout, juvenile steelhead and juvenile chinook salmon counted in July was 373, 152 and 13, respectively (Table 4). In August, the total was 287, 52 and 369 for cutthroat, juvenile steelhead and juvenile chinook salmon, respectively (Table 5). Mean cutthroat trout densities remained the same in both July and August, mean juvenile steelhead densities declined in August by 71% and juvenile chinook salmon densities increased by 2,650% in August (Tables 6 and 7).

The mean length of cutthroat trout and juvenile steelhead caught and released in July 1986 was 283 mm (N=89) and 192 mm (N=69), respectively. In August, the mean lengths were 280 mm (N=16) and 192 mm (N=16) for cutthroat trout and juvenile steelhead, respectively.

Middle Fork Tributary Transects

Seven transects on five Middle Fork tributaries were surveyed in July 1986 (Table 8). The density of juvenile steelhead/100 m^2 ranged from 0.5 in Marble Creek to 21.4 at Loon Creek Bridge (lower transect). Densities of juvenile chinook salmon ranged from 0 in Marble and Camas creeks to 8.2 fish/100 m^2 in Pistol Creek 12 (upper transect). Mean density (1/100 m^2) was 9.5 for steelhead and 3.2 for chinook in all tributary transects combined. Cutthroat trout, whitefish and bull trout were also observed (Table 8).

Table 4. Total number and species of fish counted in Middle Fork Salmon River transects, July 1986.

Transect		Cutthroat				Rainbow Steelhead				Chinook Salmon		Bull	White	
Location	Type	75–150	150–230	230–300	<300	75–150	150–230	230–300	<300	Age 0	Age 1	Trout	Fish	Other
Boundary	SH	–	–	–	4	–	4	3	–	–	–	–	7	–
Gardell's Hole	Ct/Ck	–	–	–	3	–	–	–	–	–	–	1	5	–
Velvet	Ct/Ck	–	–	1	5	3	26	4	–	–	–	1	5	–
Elkhorn	SH	–	–	–	1	3	1	–	–	–	–	–	9	–
Sheepeater	SH	–	–	–	–	–	1	–	–	–	–	–	6	–
Greyhound	Ct/Ck	–	–	1	4	–	1	–	–	–	–	–	8	–
Rapid River	SH	–	–	3	6	4	10	2	–	–	–	2	22	–
Indian	SH	–	–	4	1	–	4	2	–	–	–	–	10	–
Pungo	Ct/Ck	–	2	9	33	–	–	–	–	–	–	–	14	–
Marble Pool	Ct/Ck	–	33	42	24	–	–	–	–	1	–	–	26	–
Ski-jump	SH	–	3	4	3	–	1	–	–	–	–	–	16	–
Lower Jackass	Ct/Ck	–	5	11	2	–	2	–	–	–	–	–	46	2
Cougar	SH	–	6	4	1	–	–	–	–	–	–	–	5	–
Whitey Cox	Ct/Ck	–	2	18	4	–	2	–	–	–	–	–	12	13
Rock Island	SH	–	–	–	–	–	1	–	–	–	–	–	6	–
Hospital Pool	Ct/Ck	–	4	8	7	–	2	–	–	–	–	–	1	–
Hospital Run	SH	–	3	6	–	3	4	1	–	–	–	–	21	–
Tappan Pool	Ct/Ck	–	7	4	1	3	4	4	1	2	–	–	31	6
L. Tappan Run	SH	–	–	1	1	–	1	2	–	–	–	–	4	–
Flying B	Ct/Ck	–	–	11	3	–	–	–	–	–	–	–	4	–
Airstrip	SH	–	–	–	1	1	1	–	–	–	–	–	17	4
Survey	SH	–	1	5	1	1	4	–	–	–	–	–	11	4
Big Creek Bridge	Ct/Ck	–	1	4	4	–	1	–	–	–	–	–	17	5
Love Bar	SH	–	–	3	1	5	4	–	–	6	–	–	6	–
Ship Island	Ct/Ck	–	1	7	1	3	6	1	1	1	–	–	11	26
Little Ouzel	SH	–	–	3	1	4	3	–	–	–	–	–	5	–
Otter Bar	Ct/Ck	–	8	20	4	6	4	–	–	3	–	–	11	6
Goat Cr. Pool	Ct/Ck	–	–	9	–	2	2	–	–	–	–	–	43	68
Goat Cr. Run	SH	–	1	2	–	1	–	–	–	–	–	–	15	50
Column totals		0	77	180	116	39	92	19	2	13	0	4	394	184
Species totals			373				152			13		4	394	184

Table 5. Total number and species of fish counted in Middle Fork Salmon River transects, August 1986.

Transect		Cutthroat				Rainbow Steelhead				Chinook Salmon		Bull	White	
Location	Type	75–150	150–230	230–300	<300	75–150	150–230	230–300	<300	Age 0	Age I	Trout	Fish	Other
Boundary	Not Surveyed													
Gardell's Hole	Not Surveyed													
Velvet	Not Surveyed													
Elkhorn	Not Surveyed													
Sheepeater	Not Surveyed													
Greyhound	Not Surveyed													
Rapid River	Not Surveyed													
Indian	SH	–	3	2	–	–	2	–	–	–	–	2	12	1
Pungo	Ct/Ck	–	4	7	14	1	–	1	–	181	–	–	5	1
Marble Pool	Ct/Ck	–	1	25	41	2	1	–	–	103	–	–	29	12
Ski-Jump	SH	–	1	2	1	–	2	–	–	12	–	–	6	–
Lower Jackass	Ct/Ck	–	–	2	–	–	5	–	–	3	–	–	1	–
Cougar	SH	–	–	4	5	–	–	–	–	5	–	–	2	–
Whitey Cox	Ct/Ck	–	13	9	3	–	2	–	–	20	–	–	7	4
Rock Island	SH	–	–	–	–	–	–	–	–	–	–	–	2	–
Hospital Pool	Ct/Ck	–	25	12	4	–	3	–	–	13	–	–	3	2
Hospital Run	SH	–	1	–	–	–	3	–	–	–	–	–	2	–
Tappan Pool	Ct/Ck	–	2	10	1	2	14	1	–	29	–	–	9	12
L. Tappan Run	SH	–	–	3	–	–	–	–	–	1	–	–	4	2
Flying 8	Ct/Ck	–	7	7	6	–	–	–	–	–	–	–	2	5
Airstrip	SH	–	1	4	2	1	1	–	–	–	–	–	15	7
Survey	SH	–	3	4	–	2	–	–	–	–	–	–	8	5
Big Creek Bridge	Ct/Ck	–	4	6	3	–	–	–	–	–	–	–	12	14
Love Bar	SH	–	–	–	–	–	1	1	–	–	–	–	1	
Ship Island	Ct/Ck	–	6	12	2	–	–	–	–	–	–	–	5	3
Little Ouzel	SH	–	1	–	–	–	–	–	–	–	–	–	2	–
Otter Bar	Ct/Ck	–	5	5	2	1	4	–	–	2	–	–	9	23
Goat Cr. Pool	Ct/Ck	–	3	5	2	–	–	–	–	–	–	–	9	1
Goat Cr. Run	SH	–	–	1	1	–	2	–	–	–	–	–	13	–
Column totals		0	80	120	87	9	40	3	0	369	0	2	158	92
Species totals			287				52			369		2	158	92

Table 6. Fish densities in the Middle Fork Salmon River transacts, July 1986.

Location	Cutthroat		Rainbow		Chinook		Total fish[a]	
	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2
Boundary	7.3	0.9	12.7	1.5	0.0	0.0	32.8	3.9
Gardell's Hole	4.3	0.5	0.0	0.0	0.0	0.0	12.9	1.5
Velvet	16.2	1.9	89.2	10.5	0.0	0.0	121.6	14.3
Elkhorn	0.7	0.1	3.5	0.4	0.0	0.0	12.3	1.5
Sheepeater	0.0	0.0	1.1	0.1	0.0	0.0	7.4	0.8
Greyhound	7.4	0.8	1.5	0.2	0.0	0.0	20.6	2.2
Rapid River	4.9	0.5	8.7	1.0	0.0	0.0	26.8	2.9
Indian	3.1	0.3	3.8	0.5	0.0	0.0	13.1	1.4
Pungo	62.9	3.4	0.0	0.0	0.0	0.0	82.9	4.5
Marble Pool	54.7	3.0	0.0	0.0	0.6	0.03	69.6	3.8
Ski-jump	11.4	1.0	1.1	0.1	0.0	0.0	30.7	3.1
Lower Jackass	7.1	0.5	0.8	0.05	0.0	0.0	27.0	1.8
Cougar	10.4	1.1	0.0	0.0	0.0	0.0	15.1	1.5
Whitey Cox	22.6	1.2	1.9	0.1	0.0	0.0	48.1	2.5
Rock Island	0.0	0.0	0.9	0.1	0.0	0.0	6.4	0.6
Hospital Pool	26.8	3.1	2.8	0.3	0.0	0.0	31.0	3.6
Hospital Run	3.7	0.4	3.3	0.4	0.0	0.0	15.7	1.8
Tappan Pool	10.9	0.6	10.9	0.6	1.8	0.1	42.7	2.8
L. Tappan Run	2.6	0.3	3.9	0.5	0.0	0.0	11.7	1.4
Flying B	16.3	1.7	0.0	0.0	0.0	0.0	20.9	2.1
Airstrip	0.9	0.1	1.8	0.2	0.0	0.0	21.1	2.1
Survey	4.5	0.5	3.2	0.3	0.0	0.0	17.4	1.7
Big Cr. Bridge	8.2	0.8	0.9	0.1	0.0	0.0	29.1	3.0
Love Bar	4.4	0.5	9.9	1.1	6.6	0.8	27.4	3.2
Ship Island	7.0	0.5	8.6	0.5	0.8	0.05	45.3	2.6
Little Ouzel	4.2	0.6	7.3	1.1	0.0	0.0	16.7	2.5
Otter Bar	15.5	2.3	4.8	0.7	1.5	0.2	30.1	4.4
Goat Cr. Pool	5.5	0.4	2.4	0.2	0.0	0.0	75.2	5.5
Goat Cr. Run	4.8	0.7	1.6	0.2	0.0	0.0	111.3	16.4
Mean	11.3	1.0	6.4	0.7	0.4	0.04	35.3	3.4
Mean for steelhead transacts	4.2	0.5	4.2	0.5	0.4	0.05	24.4	3.0
Mean for cutthroat transacts	19.0	1.5	8.8	0.9	0.3	0.03	46.9	3.9

[a]Total fish includes suckers, shiners, squawfish, whitefish, cutthroat, rainbow and bull trout.

Table 7. Fish densities in the Middle Fork Salmon River transects, August 1986.

	Cutthroat		Rainbow		Chinook		Total fish[a]	
Location	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2
Boundary	Not Surveyed							
Garden's Hole	Not Surveyed							
Velvet	Not Surveyed							
Elkhorn	Not Surveyed							
Sheepeater	Not Surveyed							
Greyhound	Not Surveyed							
Rapid River	Not Surveyed							
Indian	3.1	0.3	1.3	0.1	0.0	0.0	13.8	1.1
Pungo	35.7	1.7	2.9	0.1	259.0	12.4	306.0	14.7
Marble Pool	37.0	1.9	1.7	0.08	57.0	2.9	118.2	6.0
Ski-jump	4.5	0.5	2.3	0.3	13.6	1.6	27.3	3.2
Lower Jackass	0.8	0.1	2.0	0.2	1.2	0.1	4.8	0.5
Cougar	8.5	0.9	0.0	0.0	4.7	0.5	15.1	1.5
Whitey Cox	23.6	2.4	1.9	0.2	18.7	1.9	54.7	5.6
Rock Island	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.3
Hospital Pool	57.7	5.6	4.2	0.4	18.3	1.8	87.3	8.4
Hospital Run	0.4	0.04	1.2	0.1	0.0	0.0	2.5	0.2
Tappan Pool	11.8	0.7	15.5	1.0	26.4	1.8	72.7	4.9
L. Tappan Run	3.9	0.5	0.0	0.0	1.3	0.2	13.0	1.8
Flying B	23.3	2.2	0.0	0.0	0.0	0.0	31.4	3.0
Airstrip	6.1	0.6	1.8	0.08	0.0	0.0	27.2	2.6
Survey	4.5	0.6	1.3	0.2	0.0	0.0	14.2	1.9
Big Cr. Bridge	11.8	1.5	0.0	0.0	0.0	0.0	35.5	4.4
Love Bar	0.0	0.0	2.2	0.2	0.0	0.0	3.3	0.3
Ship Island	10.9	1.1	0.0	0.0	0.0	0.0	15.3	1.4
Little Ouzel	1.0	0.2	0.0	0.0	0.0	0.0	3.1	0.5
Otter Bar	4.9	0.8	2.0	0.3	0.8	0.1	20.8	3.5
Goat Cr. Pool	6.1	0.4	0.0	0.0	0.0	0.0	12.1	0.8
Goat Cr. Run	3.2	0.4	3.2	0.4	0.0	0.0	27.4	3.7
Average	11.3	1.0	2.0	0.2	18.2	1.1	41.3	3.2
Average for steelhead transects	3.2	0.4	1.2	0.1	1.8	0.2	13.5	1.6
Average for cutthroat transects	20.3	1.7	2.7	0.2	34.7	1.9	69.0	4.8

[a]Total fish includes suckers, shiners, squawfish, whitefish, cutthroat, rainbow and bull trout.

Table 8. Middle Fork tributary transects, species counts and densities, July 1986.

Location	Lengths (mm)	Rainbow steelhead						Cutthroat					Chinook					
													Age					
		<75	75-150	150-230	230-300	>300	Rb/100 m^2	<75	75-150	150-230	230-300	>300	0	1	Ck/100 m^2	Bk	Wf	Bt
Pistol Cr. #1 (lower)		-	10	8	1	-	13.0	-	-	5	2	1	5	-	3.4	-	3	1
Pistol Cr. #2 (upper)		-	9	11	2	-	7.2	-	-	1	4	5	25	-	8.2	-	19	1
Marble Creek #1		-	1	1	1	-	0.5	-	-	3	3	1	-	-	-	-	6	-
Loon Cr. Bridge (lower)		-	17	15	6	1	21.4	-	-	-	5	1	14	-	7.7	-	6	4
Loon Creek Run (upper)		-	11	10	2	-	5.1	-	-	-	-	-	4	-	0.9	-	5	-
Big Creek #1 (lower)		-	36	24	2	-	16.8	-	-	-	2	2	8	-	2.2	-	10	-
Camas Cr. #1 (lower)		-	5	6	-	-	2.7	-	-	-	1	1	-	-	-	-	10	1
Mean							9.5								3.2			

Salmon River Tributary Transects

Three new transects were established on two streams; thus, the total number of transects surveyed in 1986 was 10 on 5 tributaries (Table 9).

Juvenile steelhead densities ranged from 4.3 fish/100 m^2 in Sheep Creek 11 to 44.0 fish/100 m^2 in the Pahsimeroi River 11 (lower transects). Mean density (1/100 m^2) was 18.7 for steelhead and 2.6 for chinook in all main stem Salmon River tributary transects combined. Very few juvenile chinook salmon or cutthroat were observed in the canyon tributaries (Table 9).

DISCUSSION

Middle Fork Salmon River Transects

Differences Between July and August 1986 Surveys

Two survey trips were taken in 1986 to determine if there was a significant difference in fish densities, particularly in chinook salmon juveniles between mid-July and late August counting times. We found that the total number of cutthroat trout counted was less in August 1986 than in July 1986 (Tables 10 and 11), but the decline (23%) was a result of the 20% decline in area surveyed (Table 12). Comparison of the percentages for age groups 1 to 4 counted in July and August indicated that the cutthroat trout population age structure had not changed (Table 10). Mean cutthroat trout densities, which were the same for July and August, indicated no change in the population (Table 13).

There was a 71% decline in mean density of juvenile steelhead counted from July to August (Table 14). The opposite was true for juvenile chinook salmon: density increased from .02 fish/100 m^2 in July to 1.1 fish/100 m^2 in August (Tables 15 and 16). This increase in juvenile chinook salmon numbers was expected because salmon typically move downstream into the Middle Fork from the headwaters and tributaries as the season advances, inhabiting primarily large, deep pools. To obtain adequate chinook counts, it appears a late-August period would be preferred.

It remains unclear whether one or two sampling surveys will be necessary to obtain true maximum summer densities of all species. The August survey is a must to count maximum numbers of juvenile chinook salmon. A late-August survey would be preferable for obtaining cutthroat trout densities, particularly to compare to historical data. August 1986 comparative counts may not provide maximum juvenile steelhead summer densities, as evidenced by the significent decline from July.

Salmonid densities determined by snorkel counts are one of the primary indices for evaluating management of wild steelhead stocks of the Middle Fork. In most years, it is not possible to float the upper 20 miles of the Middle Fork in August, making it difficult and expensive to

Table 9. Salmon River tributaries transects, species counts and densities, 1986.

Location	Rainbow steelhead						Cutthroat					Chinook					
	<75	75-150	150-230	230-300	>300	Rb/100 m^2	<75	75-150	150-230	230-300	>300	Age 0	Age 1	Ck/100 m^2	Bt	Bk	Wf
Horse Cr. Bridge	7	42	45	1	-	22.5	-	-	1	-	-	-	-	-	-	-	13
Horse Cr. #2	3	15	13	1	-	14.8	-	-	-	-	-	-	-	-	-	-	2
Chamberlain Cr. mouth	-	12	13	-	-	17.6	-	-	-	-	-	1	-	0.7	-	-	5
Chamberlain Run	-	18	13	2	-	17.9	-	-	-	-	1	1	1	1.1	-	-	4
Bargamin Cr. #1	-	15	11	1	-	10.9	-	-	-	-	-	-	-	-	-	-	8
Bargamin Cr. #2	-	15	20	3	-	9.4	-	-	-	-	-	-	-	-	-	-	13
Sheep Cr. #1	-	5	9	-	-	4.3	-	-	-	-	-	-	-	-	-	-	6
Sheep Cr. #2	1	10	15	-	-	28.4	-	-	-	-	-	-	-	-	-	-	5
Pahsimeroi River Dowton Lane	-	5	30	17	9	17.6	-	-	-	-	-	43	21	18.4	-	2	51
Pahsimeroi River Lower	-	15	26	12	2	44.0	-	-	-	-	-	1	6	5.6	-	6	-
Mean						18.7								2.6			

Table 10. Total number *of* cutthroat trout counted in Middle Fork Salmon River transects, July 1985, July 1986 and August 1986.

Location	Type	July 1985				July 1986				August 1986			
		75-150	150-230	230-300	<300	75-150	150-230	230-300	<300	75-150	150-230	230-300	<300
Boundary	SH	-	-	7	3	-	-	-	4		Not Surveyed		
Gardell's Hole	Ct/Ck	5	2	-	-	-	-	-	3		Not Surveyed		
Velvet	Ct/Ck	-	-	-	2	-	-	1	5		Not Surveyed		
Elkhorn	SH	-	-	1	5	-	-	-	1		Not Surveyed		
Sheepeater	SH	-	-	-	-	-	-	-	-		Not Surveyed		
Greyhound	Ct/Ck	-	-	-	6	-	-	1	4		Not Surveyed		
Rapid River	SH		Not Surveyed			-	-	3	6		Not Surveyed		
Indian	SH	-	-	-	2	-	-	4	1	-	3	2	-
Pungo	Ct/Ck	-	2	-	-	-	2	9	33	-	4	7	14
Marble Pool	Ct/Ck		Not Surveyed			-	33	42	24	-	1	25	41
Ski-jump	SH	-	-	2	2	-	3	4	3	-	1	2	1
Lower Jackass	Ct/Ck	-	2	1	-	-	5	11	2	-	-	2	-
Cougar	SH	-	-	2	2	-	6	4	1	-	-	4	5
Whitey Cox	Ct/Ck	-	-	3	1	-	2	18	4	-	13	9	3
Rock Island	SH		Not Surveyed			-	-	-	-	-	-	-	-
Hospital Pool	Ct/Ck	-	3	8	1	-	4	8	7	-	25	12	4
Hospital Run	SH	-	2	4	-	-	3	6	-	-	1	-	-
Tappan Pool	Ct/Ck	-	-	3	-	-	7	4	1	-	2	10	1
L. Tappan Run	SH	1	-	-	-	-	-	1	1	-	-	3	-
Flying B	Ct/Ck	-	-	6	-	-	-	11	3	-	7	7	6
Airstrip	SH	-	-	2	2	-	-	-	1	-	1	4	2
Survey	SH	-	-	6	1	-	1	5	1	-	3	4	-
Big Cr. Bridge	Ct/Ck		Not Surveyed			-	1	4	4	-	4	6	3
Love Bar	SH	-	1	-	-	-	-	3	1	-	-	-	-
Ship Island	Ct/Ck	-	-	-	6	-	1	7	1	-	6	12	2
Little Ouzel	SH	-	-	1	-	-	-	3	1	-	1	-	-
Otter Bar	Ct,/Ck	2	7	3	-	-	8	20	4	-	5	5	2
Goat Cr. Pool	Ct/Ck	-	-	-	8	-	-	9	-	-	3	5	2
Goat Cr. Run	SH	-	-	3			1	2	-	-	-	1	1
Column totals		8	19	52	41	0	77	180	116	0	80	120	87
Species totals			120				373				287		
Percentage of totals		7	16	43	34	0	21	48	31	0	28	42	30

Table 11. Total number of juvenile steelhead counted in Middle Fork Salmon River transacts, July 1985, July 1986 and August 1986.

Location	Type	July 1985				July 1986				August 1986			
		75-150	150-230	230-300	<300	75-150	150-230	230-300	<300	75-150	150-230	230-300	<300
Boundary	SH	6	9	1	-	-	4	3	-		Not Surveyed		
Garden's Hole	Ct/Ck		1	2	-	-	-	-	-		Not Surveyed		
Velvet	Ct/Ck	11	4	-	-	3	26	4	-		Not Surveyed		
Elkhorn	SH	2	9	2	-	3	1	-	-		Not Surveyed		
Sheepeater	SH	3	8	1	-	-	1	-	-		Not Surveyed		
Greyhound	Ct/Ck		2	-	-	-	1	-	-		Not Surveyed		
Rapid River	SH		Not Surveyed			4	10	2	-		Not Surveyed		
Indian	SH		2	-	-	-	4	2	-	-	2	-	-
Pun go	Ct/Ck			3	-	-	-	-	-	1	-	1	-
Marble Pool	Ct/Ck		Not Surveyed			-	-	-	-	2	1	-	-
Ski-jump	SH				-	-	1	-	-	-	2	-	-
Lower Jackass	Ct/Ck	1	-	-	-	-	2	-	-	-	5	-	-
Cougar	SH	-	2	1									
Whitey Cox	Ct/Ck						2	-	-	-	2	-	-
Rock Island	SH		Not Surveyed			-	1	-	-	-	-	-	-
Hospital Pool	Ct/Ck	1	1	-	-	-	2	-	-	-	3	-	-
Hospital Run	SH	1	1	-	-	3	4	1	-	-	3	-	-
Tappan Pool	Ct/Ck	-	-	-	-	3	4	4	1	2	14	1	-
L. Tappan Run	SH	-	-	-	-	-	1	2	-	-	-	-	-
Flying B	Ct/Ck												
Airstrip	SH	-	2	-	-	1	1	-	-	1	1	-	-
Survey	SH	-	1	-	-	1	4	-	-	2	-	-	-
Big Cr. Bridge	Ct/Ck		Not Surveyed			-	1	-	-	-	-	-	-
Love Bar	SH	1	1	-	-	5	4	-	-	-	1	1	-
Ship Island	Ct/Ck	3	-	1	-	3	6	1	1	-	-	-	-
Little Ouzel	SH	-	-	-	-	4	3	-	-	-	-	-	-
Otter Bar	Ct/Ck	5	3	1	-	6	4	-	-	1	4	-	-
Goat Cr. Pool	Ct/Ck	2	-	-	-	2	2	-	-	-	-	-	-
Goat Cr. Run	SH	1	2	-	-	1	-	-	-	-	2	-	-
Column totals		37	48	12	0	39	92	19	2	9	40	3	0
Species totals			97				152				52		
Percentage oftotels		38	49	12	0	26	61	13	1	17	77	6	0

Table 12. Area snorkeled in Middle Fork Salmon River transects, 1986.

Location	Length (m) July	Aug.	Visibility(m) July	Aug.	Visible corridor July	Aug.	Area m^2 July	Aug.
Boundary	54.9		4.27		8.5		467	
Gardell's Hole	69.5		4.27		8.5		591	
Velvet	37.0		4.27		8.5		351	
Elkhorn	114.0		4.2		8.0		912	
Sheepeater	95.0		4.6		9.2		874	
Greyhound	68.0		4.6		9.2		626	
Rapid River	183.0		4.6		9.2		1,684	
Indian	160.0	160.0	4.6	6.1	9.2	12.2	1,472	1,952
Pungo	70.0	70.0	4.6	5.2	18.4	20.8	1,288	1,456
Marble Pool	181.0	181.0	4.6	4.9	18.4	19.6	3,330	3,548
Ski-jump	88.0	88.0	4.6	4.3	9.2	8.6	810	757
Lower Jackass	252.0	252.0	3.7	4.6	14.8	9.2	3,710	2,318
Cougar	106.0	106.0	4.9	4.9	9.8	9.8	1,039	1,039
Whitey Cox	106.0	106.0	4.9	4.9	19.6	9.8	2,078	1,039
Rock Island	110.0	110.0	4.9	3.0	9.8	6.0	1,078	660
Hospital Pool	71.0	71.0	4.3	5.2	8.6	10.4	611	738
Hospital Run	242.0	242.0	4.3	5.2	8.6	10.4	2,081	2,517
Tappan Pool	110.0	110.0	4.3	3.7	17.2	14.8	1,892	1,628
L. Tappan Run	77.0	77.0	4.3	3.7	8.6	7.4	662	570
Flying B	86.0	86.0	4.9	5.2	9.8	10.4	843	894
Airstrip	114.0	114.0	4.9	5.2	9.8	10.4	1,117	1,186
Survey	155.0	155.0	4.9	3.7	9.8	7.4	1,519	1,147
Big Cr. Bridge	110.0	110.0	4.9	4.0	9.8	8.0	1,078	880
Love Bar	91.0	91.0	4.3	5.2	8.6	10.4	783	946
Ship Island	128.0	183.0	4.3	5.2	17.2	10.4	2,202	1,903
Little Ouzel	96.0	96.0	3.4	3.0	6.8	6.0	653	576
Otter Bar	206.0	245.0	3.4	3.0	6.8	6.0	1,401	1,470
Goat Cr. Pool	165.0	165.0	3.4	3.7	13.6	14.8	2,244	2,442
Goat Cr. Run	62.0	62.0	3.4	3.7	6.8	7.4	422	459
Total	--	--	--	--	--	--	37,818	30,125

Table 13. Cutthroat trout densities in Middle Fork Salmon River, July 1985, July 1986 and August 1986.

	July 1985		July 1986		Aug. 1986	
Location	#/100 m	1/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2
Boundary	21.1	2.4	7.3	0.9	Not Surveyed	
Gardell's Hole	10.1	0.6	4.3	0.5	Not Surveyed	
Velvet	5.4	0.6	16.2	1.9	Not Surveyed	
Elkhorn	5.3	0.6	0.7	0.1	Not Surveyed	
Sheepeater	0.0	0.0	0.0	0.0	Not Surveyed	
Greyhound	10.3	0.6	7.4	0.8	Not Surveyed	
Rapid River	Not Surveyed		4.9	0.5	Not Surveyed	
Indian	1.3	0.3	3.1	0.3	3.1	0.3
Pungo	4.3	0.4	62.9	3.4	35.7	1.7
Marble Pool	Not Surveyed		54.7	3.0	37.0	1.9
Ski-jump	4.5	0.4	11.4	1.0	4.5	0.5
Lower Jackass	1.2	0.1	7.1	0.5	0.8	0.1
Cougar	3.5	0.4	10.4	1.1	8.5	0.9
Whitey Cox	7.5	0.3	22.6	1.2	23.6	2.4
Rock Island	Not Surveyed		0.0	0.0	0.0	0.0
Hospital Pool	11.9	1.4	26.8	3.1	51.7	5.6
Hospital Run	3.7	0.6	3.7	0.4	0.4	0.04
Tappan Pool	2.7	0.2	10.9	0.6	11.8	0.7
L. Tappan Run	1.3	0.2	2.6	0.3	3.9	0.5
Flying B	8.6	0.5	16.3	1.7	23.3	2.2
Airstrip	3.5	0.5	0.9	0.1	6.1	0.6
Survey	4.5	0.6	4.5	0.5	4.5	0.6
Big Cr. Bridge	Not Surveyed		8.2	0.8	11.8	1.5
Love Bar	5.6	0.2	4.4	0.5	0.0	0.0
Ship Island	4.7	0.3	7.0	0.5	10.9	1.1
Little Ouzel	1.0	0.1	4.2	0.6	1.0	0.2
Otter Bar	5.8	0.4	15.5	2.3	4.9	0.8
Goat Cr. Pool	2.2	0.2	5.5	0.4	6.1	0.4
Goat Cr. Run	4.8	0.8	4.8	0.7	3.2	0.2
Mean	5.4	0.5[a]	11.3	1.0[b]	11.3	1.0

[a]No significant difference between July 1985 and July 1986 densities (#/100 m^2), α =.05.

[b]Significant increase between July and August 1986 densities (#/100 m^2), α =.05.

Table 14. Juvenile steelhead densities in Middle Fork Salmon River, July 1985, July 1986 and August 1986.

	July 1985		July 1986		Aug. 1986	
Location	1/100 m	1/100 m^2	1/100 m	1/100 m^2	1/100 m	1/100 m^2
Boundary	33.7	3.9	12.7	1.5	Not Surveyed	
Gardell's Hole	4.3	0.3	0.0	0.0	Not Surveyed	
Velvet	40.5	4.8	89.2	10.5	Not Surveyed	
Elkhorn	11.4	1.2	3.5	0.4	Not Surveyed	
Sheepeater	12.6	0.7	1.1	0.1	Not Surveyed	
Greyhound	3.4	0.2	1.5	0.2	Not Surveyed	
Rapid River	Not Surveyed		8.7	1.0	Not Surveyed	
Indian	1.3	0.3	3.8	0.5	1.3	0.1
Pungo	2.9	0.3	0.0	0.0	7.9	0.1
Marble Pool	Not Surveyed		0.0	0.0	1.7	0.08
Ski-jump	0.0	0.0	1.1	0.1	2.3	0.3
Lower Jackass	0.4	0.03	0.8	0.05	2.0	0.2
Cougar	2.6	0.3	0.0	0.0	0.0	0.0
Whitey Cox	0.0	0.0	1.9	0.1	1.9	0.2
Rock Island	Not Surveyed		0.9	0.1	0.0	0.0
Hospital Pool	2.8	0.2	2.8	0.3	4.2	0.4
Hospital Run	1.2	0.2	3.3	0.4	1.2	0.1
Tappan Pool	0.0	0.0	10.9	0.6	15.5	1.0
L. Tappan Run	0.0	0.0	3.9	0.5	0.0	0.0
Flying B	0.0	0.0	0.0	0.0	0.0	0.0
Airstrip	1.8	0.2	1.8	0.2	1.8	0.08
Survey	0.6	0.1	3.2	0.3	1.3	0.2
Big Cr. Bridge	Not Surveyed		0.9	0.1	0.0	0.0
Love Bar	2.2	0.3	9.9	1.1	2.2	0.2
Ship Island	3.1	0.2	8.6	0.5	0.0	0.0
Little Ouzel	0.0	0.0	7.3	1.1	0.0	0.0
Otter Bar	4.4	0.3	4.8	0.7	2.0	0.3
Goat Cr. Pool	0.5	0.05	2.4	0.2	0.0	0.0
Goat Cr. Run	4.8	0.8	1.6	0.2	3.2	0.4
Mean	5.4	0.6[a]	6.4	0.7[b]	2.0	0.2

[a]llo significant difference between July 1985 and July 1986 densities (#/100 m^2), α =.05.

[b]Significant increase between July and August 1986 densities (#/100 m^2), α =.05.

Table 15. Total number of juvenile chinook salmon counted in Middle Fork Salmon River transacts, July 1985, July 1986 and August 1986.

Location	July 1985					July 1986				August 1986			
	Chinook salmon			Bull	White	Chinook salmon		Bull	White	Chinook salmon		Bull	White
	Type	Age 0	Age 1	trout	fish	Age 0	Age 1	trout	fish	Age 0	Age 1	trout	fish
Boundary	SH	-	-	-	14	-	-	-	7		Not Surveyed		
Gerdell's Hole	Ct/Ck	-	-	-	8	-	-	1	5		Not Surveyed		
Velvet	Ct/Ck	-	1	-	2	-	-	1	5		Not Surveyed		
Elkhorn	SH	-	-	-	7	-	-	-	9		Not Surveyed		
Sheepeater	SH	-	-	-	6	-	-	-	6		Not Surveyed		
Greyhound	Ct/Ck	-	-	-	4	-	-	-	B		Not Surveyed		
Rapid River	SH		Not Surveyed			-	-	2	22		Not Surveyed		
Indian	SH	-	-	-	-	-	-	-	10	-	-	2	12
Pungo	Ct/Ck	-	-	-	-	-	-	-	14	181	-	-	5
Marble Pool	Ct/Ck		Not Surveyed			1	-	-	26	103	-	-	29
Ski-jump	SH	-	-	-	4	-	-	-	16	12	-	-	6
Lower Jackass	Ct/Ck	-	-	-	-	-	-	-	46	3	-	-	1
Cougar	SH	-	-	-	4		-	-	5	5	-	-	2
Whitey Cox	Ct/Ck	-	-	-	1	-	-	-	12	20	-	-	7
Rock Island	SH		Not Surveyed			-	-	-	6	-	-	-	2
Hospital Pool	Ct/Ck	-	-	-	2	-	-	-	1	13	-	-	3
Hospital Run	SH	-	-	-	1	-	-	-	21	-	-	-	2
Tappan Pool	Ct/Ck	-	-	-	-	2	-	-	31	29	-	-	9
L. Tappan Run	SH	2	-	-	2	-	-	-	4	1	-	-	4
Flying B	Ct/Ck	-	-	-	6	-	-	-	4	-	-	-	2
Airstrip	SH	-	-	-	1	-	-	-	17	-	-	-	15
Survey	SH	-	-	-	2	-	-	-	11	-	-	-	8
Big Cr. Bridge	Ct/Ck		Not Surveyed			-	-	-	17	-	-	-	12
Love Bar	SH	-	-	-	2	6	-	-	6	-	-	-	1
Ship Island	Ct/Ck	-	-	-	-	1	-	-	11	-	-	-	5
Little Ouzel	SH	-	-	-	5	-	-	-	5	-	-	-	2
Otter Bar	Ct/Ck	-	-	-	26	3	-	-	11	2	-	-	9
Goat Cr. Pool	Ct/Ck	-	-	-	37	-	-	-	43	-	-	-	9
Goat Cr. Run	SH	-	-	-	16	-	-	-	15	-	-	-	13
Totals	2		• 1	0	150	13	0	4	394	369	0	2	158

Table 16. Juvenile chinook salmon densities in Middle Fork Salmon River, July 1985, July 1986 and August 1986.

	July 1985		July 1986		Aug. 1986	
Location	1/100 m	1/100 m^2	1/100 m	1/100 m^2	1/100 m	1/100 m^2
Boundary	0.0	0.0	0.0	0.0	Not Surveyed	
Gardell's Hole	0.0	0.0	0.0	0.0	Not Surveyed	
Velvet	2.7	0.003	0.0	0.0	Not Surveyed	
Elkhorn	0.0	0.0	0.0	0.0	Not Surveyed	
Sheepeater	0.0	0.0	0.0	0.0	Not Surveyed	
Greyhound	0.0	0.0	0.0	0.0	Not Surveyed	
Rapid River	Not Surveyed		0.0	0.0	Not Surveyed	
Indian	0.0	0.0	0.0	0.0	0.0	0.0
Pungo	0.0	0.0	0.0	0.0	259.0	12.4
Marble Pool	Not Surveyed		0.6	0.03	57.0	2.9
Ski-jump	0.0	0.0	0.0	0.0	13.6	1.6
Lower Jackass	0.0	0.0	0.0	0.0	1.2	0.1
Cougar	0.0	0.0	0.0	0.0	4.7	0.5
Whitey Cox	0.0	0.0	0.0	0.0	18.7	1.9
Rock Island	Not Surveyed		0.0	0.0	0.0	0.0
Hospital Pool	0.0	0.0	0.0	0.0	18.3	1.8
Hospital Run	0.0	0.0	0.0	0.0	0.0	0.0
Tappan Pool	0.0	0.0	1.8	0.1	76.4	1.8
L. Tappan Run	2.6	0.4	0.0	0.0	1.3	0.2
Flying B	0.0	0.0	0.0	0.0	0.0	0.0
Airstrip	0.0	0.0	0.0	0.0	0.0	0.0
Survey	0.0	0.0	0.0	0.0	0.0	0.0
Big Cr. Bridge	Not Surveyed		0.0	0.0	0.0	0.0
Love Bar	0.0	0.0	6.6	0.8	0.0	0.0
Ship Island	0.0	0.0	0.8	0.05	0.0	0.0
Little Ouzel	0.0	0.0	0.0	0.0	0.0	0.0
Otter Bar	0.0	0.0	1.5	0.2	0.8	0.1
Goat Cr. Pool	0.0	0.0	0.0	0.0	0.0	0.0
Goat Cr. Run	0.0	0.0	0.0	0.0	0.0	0.0
Mean	0.2	0.02[a]	0.4	0.02[b]	18.2	1.1

[a]No significant difference between July 1985 and July 1986 densities (#/100 m^2), α =.05.

[b]Significant increase between July and August 1986 densities (#/100 m^2), α =.05.

collect density in that area. Comparative counts should be evaluated for another year to determine if the July to August difference for steelhead and chinook remains consistent. A decision can then be made whether two survey trips annually are needed to collect trend data.

Differences between July 1985 and July 1986 Surveys

The July 1986 survey was similar to the July 1985 survey, with the exception of four transects not surveyed in 1985 (Reingold and Davis 1987). The increase in total number for all game fish species counted was a result of improved visibility and a larger area counted. The mean density of cutthroat (1/100 m^2) increased 1092 from 1985 to 1986 (Table 13).

The August 1986 cutthroat counts were basically comparable to eleven transects counted in 1971, 1978 and 1984. Time of counts, counting technique and visibility were relatively the same.

The total number of cutthroat counted diminished 29% and 32% from 1978 and 1984 total counts (248 vs. 319 and 327) (Fig. 2). Younger age cutthroat (<152 mm) were nearly three times as prevalent in the population than any prior counts (282), older age adults (>305 mm) remained the same (31%) and counts of fish between 152 mm and 305 mm showed a decline from previous years' numbers (Appendix E). Whether this trend would be similar for density (fish/100 m^2) estimates is unknown. Densities are unavailable for 1971 and 1978.

Although not significant, the increase in juvenile steelhead numbers byy 57% (Table 11) and density by 17% (Table 14) does continue to show an increasing trend since 1982 (Fig. 3). Synchroniously, downstream factors (e.g., dams and fishing) affect passage mortality and mask any changes due to natural factors.

We cannot readily explain these changes in densities (fish/100 m^2) or apparent shifts of age class prevalence. A combination of natural factors--high spring runoff, forest fires leading to increased sediment loads, drought years, angling mortality and competition with juvenile steelhead all occurring in the area in the last decade--would impact the population. Most of the competion between the two species occurs in the tributaries and not in the main stem. Westslope cutthroat generally do not migrate into the main stem of the Middle Fork until the third summer when they are approximately 228 mm in total length. At this time, cutthroat tend to move into pools (typical cutthroat habitat). Cutthroat trout that move into marginal cutthroat habitat (e.g., steelhead habitat) could be outcompeted by steelhead and forced to vacate this type of habitat.

Steelhead densities, at the present time, are at low levels and may limit competition with cutthroat in the marginal habitat. At the present densities, steelhead are at a maintenance level and natural factors could have a much greater impact on the juvenile population. Comparative counts in forthcoming years will provide a clearer picture.

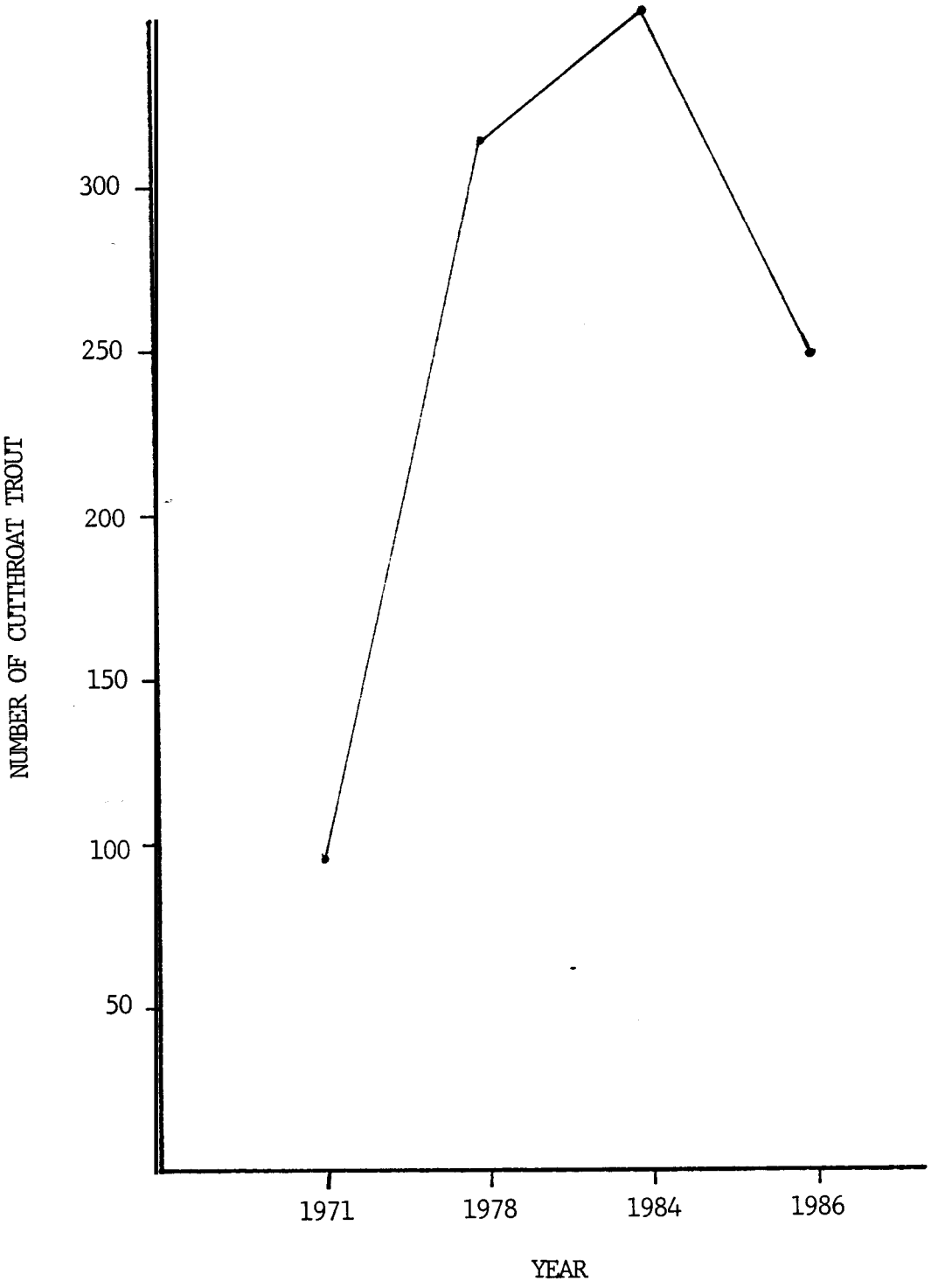

Figure 2. Total number of cutthroat trout counted in comparable transects of the Middle Fork Salmon River, 1971, 1978, 1984 and 1986.

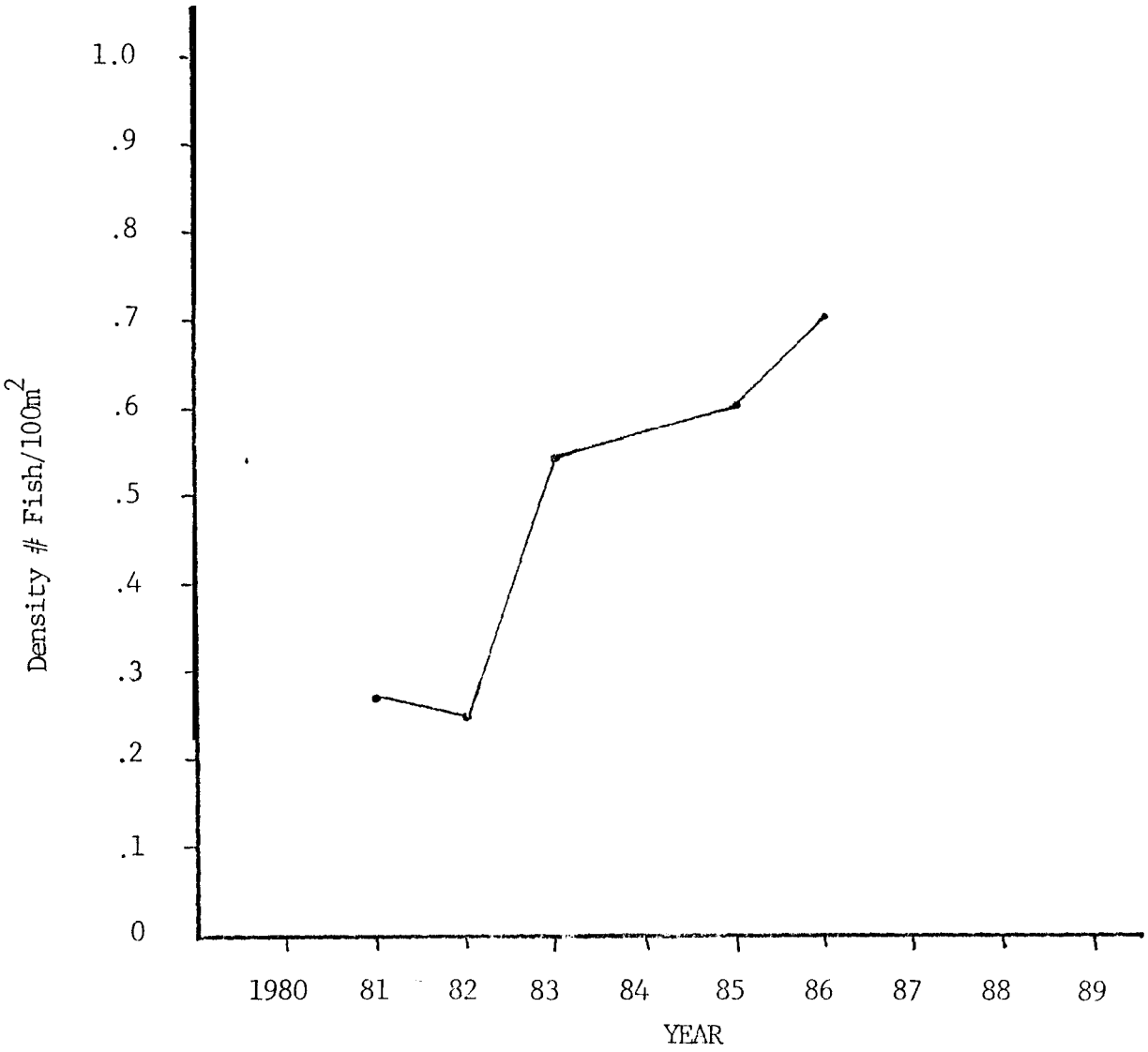

Figure 3. Middle Fork Salmon River mean juvenile steelhead densities, 1981-86.

Middle Fork Tributary Transects

The overall densities of juvenile steelhead found in the tributaries in July 1986 (Table 8) increased over the densities measured in 1985 (Table 17). The only transect that declined was Marble Creek, which has a sediment problem that reduces trout habitat and embryo survival.

The overall densities of juvenile chinook salmon found in the tributary transects counted in July 1986 (Table 8) increased 88% over the densities measured in 1985 (Table 17). Actual numbers, however, were low: 56 in 1986 versus 20 in 1985. Total numbers of cutthroat counted in the tributaries were similar in 1986 and 1985 (37 vs. 39).

Salmon River Tributary Transects

The total number of juvenile steelhead counted in July 1986 (Table 9) in the Salmon River canyon tributary transects (excluding the Pahsimeroi River) increased 27% over the 1985 totals (171 vs. 218) (Table 18). Mean steelhead density for all tributary transects surveyed, except the Pahsimeroi River, was 15.7 fish/100 m^2 in 1986 versus 11.4 fish/100 m^2 in 1985, representing an increase of 38%.

The overall densities of juvenile chinook salmon found in the main stem Salmon River tributaries surveyed in 1986 (excluding the Pahsimeroi River) increased to .23/100 m^2 from zero in 1985. Total number counted was only 3 fish, however.

The Pahsimeroi River densities collected reflect the effects of artificial introduction of hatchery-produced steelhead and salmon.

Table 17. Middle Fork tributary transacts, species counts and densities, 1985.

		Rainbow steelhead					Cutthroat					Chinook					
Location	Lengths (mm)	<75	75—150	150⁻230	230⁻300	Rb/100 m^2	<75	75⁻150	150—230	230—300	>300	0	1		2	Wf	Bt
Pistol Cr. 1		6	1	6	2	10.3			1	—	1		—	—	—		2
Pistol Cr. #2		4	3	4	3	4.6	1	5	7	11	2		4		1.3		12
Marble Creek		—	2	3	—	0.8	—	—	1	—	—		—	—	—		1
Loon Cr. Bridge		—	13	3	1	9.3	3	3	—	4	—	15	1	8.8	—		5
Loon Creek Run		6	12	6	—	5.3	—	—	—	—	—		—	—	—		3
Big Creek		9	32	12	—	8.2	—	—	—	—	—		—	—	—	8	—
Camas Cr.			Not Surveyed														
Mean						6.4									1.7		

Table 18. Salmon River tributaries transacts, species counts and densities, 1985.

Location	Rainbow steelhead						Cutthroat					Chinook							
												Age							
	<7	75-150	150-230	230-300	>30	Rb/100 m²	<75	75-150	150-230	230-300	>300	0	1	Ck/100 m²	Bt	Bk	Wf	Rh/100 m²	1981
Horse Cr. Bridge	21	22	38	8	–	20.6	–	–	–	–	–	–	–	–	–	–	17	12.5	
Horse Cr. #2			Establish 1986																
Chamberlain Cr. mouth	4	3	8	–	–	10.6	–	–	–	–	–	–	–	–	–	–	12	9.5	
Chamberlain Run	3	3	7	3	–	9.8	–	–	–	–	2	–	–	–	–	–	27	–	
Bargamin Cr. #1	4	6	13	1	2	9.7	–	–	–	–	1	–	–	–	–	–	3	9.8	
Bargamin Cr. #2	6	4	13	2	–	- 6.2	–	–	1	–	–	–	–	–	–	–	3	–	
Sheep Cr. #1			Establish 1986																
Sheep Cr. #2		Establish 1986																	
Pahsimeroi River Dowton Lane	–	–	60	50	31	40.6	–	–	–	–	–	–	–	–	–	1	26	–	
Pahsimeroi River Lower	–	–	77	14	2	74.4	–	–	–	–	–	2	2	3.2	–	6	19	–	

JOB PERFORMANCE REPORT

State of: Idaho

Name: Regional Fishery Management Investigations

Project No.: F-71-R-11

Title: Salmon Subregion Technical Guidance

Job No.: 6(SAL)-d

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

During 1986, technical assistance was provided to all state and federal agencies upon request. Comments were submitted to various agencies and private entities concerning stream alterations, bank stabilization, mining operations and reclamation plans, fish rearing proposals, private ponds, water withdrawal applications, gravel removal projects, highway reconstruction, bridge replacement and hydropower-related matters.

Also, we responded to the general public in person and by telephone and mail to inquiries about fishing opportunities, techniques, regulations and area specifics.

Author:

Melvin Reingold
Regional Fishery Manager

OBJECTIVES

1. To assist the Department of Water Resources, the Department of Lands, the U.S. Army Corps of Engineers and other state, federal, local and private entities in evaluating the effects of habitat manipulation on fish and fish habitat.

2. To recommend procedures that minimize adverse effects of stream course alterations on aquatic habitat and fish.

3. To provide information on all aspects of fisheries and aquatic habitat as requested.

TECHNIQUES

We responded to all requests for data, expertise and recommendations from individuals, government agencies and corporations. Meetings were attended, field inspections conducted and responses generated as appropriate.

RESULTS

During 1986, we responded in writing to requests for technical assistance or comments on various water and fishery-related matters as follows:

Agency	Number of requests
U.S. Forest Service	4
Idaho Department of Water Resources	17
U.S. Fish and Wildlife Service	4
Idaho Department of Lands	8
Idaho Department of Transportation	1
U.S. Bureau of Land Management	1
U.S. Army Corps of Engineers	2
U.S. Environmental Protection Agency	2
Private and Miscellaneous	8

Communication by telephone conversation was the greatest portion of contact to other agencies. Commonly, we respond to a request for information on stream alteration proposals by meeting with the applicant on-site, determining the nature of the situation and communicating with the appropriate agency either by letter, or more often, by telephone. The remoteness of the Salmon Subregion usually precludes representatives from agencies based in distant population centers from conducting on-site inspections on routine or minor applications. On these types, we normally function as direct observers for outside agencies on an informal basis.

We advised two individuals on questions and proposals concerning fish ponds.

We responded to a myriad of inquiries from the public (by telephone, letter and in person) about when, where and how to participate in various fisheries in the region, ranging from steelhead angling to high mountain lake fishing.

JOB PERFORMANCE REPORT

State of: Idaho

Name: Regional Fishery Management Investigations

Project No.: F-71-R-11

Title: Salmon Subregion Salmon and Steelhead Investigations

Job No.: 6(SAL)-e

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

Steelhead Angler Creel Checks

In the spring and fall of 1986, we used a jet boat to collect angler and creel data in the roadless portion of the Salmon River canyon below Corn Creek within the River of No Return Wilderness Area.

The spring season was curtailed by poor water conditions. During the fall season, we checked 595 anglers who spent 3,581 hours to catch 242 steelhead (14.8 hr/fish). Wild steelhead comprised 43% of the catch and were released unharmed (by regulation).

Marked steelhead carrying coded wire tags were recovered from the fishery as part of other ongoing research projects.

Author:

Melvin Reingold
Regional Fishery Manager

OBJECTIVES

1. To monitor the steelhead sport fishery in the roadless portion of the Salmon River canyon below Cork Creek within the River of No Return Wilderness Area.

2. To collect information on catch rates, hatchery-wild composition, angler participation and to recover marked (coded wire-tagged) steelhead in the fishery.

3. To provide data to be used with information gathered from other operating projects to estimate harvest levels and return of marked experimental groups of steelhead to the river.

4. To work with commercial steelhead jet boat outfitters and guides to promote understanding of the steelhead resources targeted by them. To foster acceptance and compliance of special regulations and programs to enhance wild steelhead survival.

RECOMMENDATIONS

Monitor the canyon steelhead fishery and collect harvest data.

TECHNIQUES

In the spring of 1985 and the fall of 1986, we collected data on numbers of anglers, hours fished and fish caught in the 80-mile long Salmon River roadless (wilderness) canyon from Corn Creek (river mile 191) to Vinegar Creek (river mile 112). A jet boat was used to contact anglers, of which the majority were customers of commercial jet boat outfitters and guides.

We inspected fish in the anglers possession for sex, length and the presence of marks or tags. Snouts were collected from steelhead flagged by a left ventral clip for eventual recovery of coded wire tags. Information was also collected on the number of wild steelhead caught and released.

Sampling dates were scheduled to coincide with a sampling scheme developed for harvest estimate projects to draw statewide harvest estimates of steelhead stocks. Data collected was also used to provide timely fishing information to answer inquiries received at the local Fish and Game office.

RESULTS AND DISCUSSION

The following data was collected via jet boat interviews in the spring of 1986.

Salmon River Section 14

Dates	Anglers	Hours	Steelhead Kept	Rel.	Total	Hr/fish	% Hatchery
03/11-13	23	175	1	3	4	44	25
03/17-19	17	133	2	3	5	27	40
Totals	40	308	3	6	9	34	33

The spring of 1986 was a relatively poor season for steelhead fishing below the Middle Fork (Salmon River, Section 14). The ice did not leave the river canyon until nearly mid-March and the river was high and off-color for much of the season.

The following data was collected by jet boat interviews in the fall of 1986.

Salmon River Section 14

Steelhead

Dates	Anglers	Hours	Kept	Rel.	Total	Hr/fish	% Hatchery
09/18-20	6	54	1	3	4	13.5	25
09/26-28	21	192	1	5	6	32.0	17
10/03-04	13	64	1	5	6	10.6	17
10/11-13	54	207	5	6	11	18.8	45
10/17-19	148	895	34	23	57	15.7	60
10/24-26	122	905	22	16	38	23.8	58
11/01-03	123	594	26	22	48	12.4	54
11/14-16	108	670	48	24	72	9.3	67
Totals	595	3,581	138	104	242	14.8	57

Comparison with data collected since 1983 appears as follows:

Dates	Anglers	Hours	Steelhead Kept	Steelhead Rel.	Steelhead Total	Hr/fish	% Hatchery
1983	563	3,836	114	105	219	17.5	52
1984	551	3,794	79	112	191	20.0	35
1985	457	2,901	150	115	265	11.0	56
1986	595	3,581	138	104	242	14.8	57

Effort and catch remained fairly consistent with past years. Wild steelhead comprised 43% of the total steelhead caught. Regulations require all wild steelhead (fish bearing an adipose fin) be released unharmed.

Mandatory release of wild steelhead went into effect in the fall of 1982. The first adult returns resulting from this program should enter the Salmon River as one-ocean fish in the fall of 1987. The creel census conducted at that time may help determine if that management scheme is benefiting wild stocks.

Appendix A. Gillnetting summary, Sawtooth National Recreation Area, 1986.

Species	R5		Bt		Lt		Bk		K		Wf		RS	Su	Sq	% Non-
Name	#	L	#	L	#	L	#	L	#	L	#	L	#	#	#	Game
Redfish	11	275	19	315	-	-	-	-	-	-	3	213	P	37	9	61
Stanley	25	271	-	-	12	650	-	-	22	203	-	-	-	-	-	0
Alturas	18	262	9	367	-	-	-	-	-	-	4	227	-	30	23	63
Pettit	2	295	-	-	-	-	9	248	7	176	-	-	3	0	1	18
Yellowbelly	-	-	-	-	-	-	11	260	-	-	-	-	-	75	-	87
Perkins	-	-	3	440	-	-	-	-	-	-	13	225	-	70	33	87
L. Redfish	7	289	1	470	-	-	-	-	-	-	-	-	-	30	25	87

Appendix B. Mean lengths of fish harvested in 1986.

	Rainbow		Bk		Kokanee	
	#	$\bar{L}$	#	$\bar{L}$	#	$\bar{L}$
Stanley Lake	502	254	38	194	110	202

	Rainbow		Bt		Kokanee	
	#	$\bar{L}$	#	$\bar{L}$	#	$\bar{L}$
Redfish Lake	397	268	32	398	73	232

	Rainbow		Bt		Kokanee	
	#	$\bar{L}$	#	$\bar{L}$	#	$\bar{L}$
Alturas Lake	135	269	22	412	2	175

	Bk		Ct	
	#	$\bar{L}$	#	$\bar{L}$
	1	305	1	365

Appendix C. Middle Fork Salmon River tributary transect description and area surveyed, 1986.

Location	Description	Length (m)	Width (m)	Area (m^2)
Pistol Cr. #1	at mile marker 16	15	9.7	146
Pistol Cr. 12	above mile marker 16	30	10.2	306
Marble Cr. mouth	above Pack Bridge	75	7.9	593
Loon Cr. Bridge	below Pack Bridge	17	10.7	182
Loon Cr. Run	400 yd. above Pack Bridge	30	15.0	450
Camas Cr.	Pack Bridge downstream	30	13.4	402
Big Creek mouth	400 yd. above mouth	72	9.0	648

Appendix D. Salmon River tributaries transect description and area surveyed, 1986.

Location	Description	Length (m)	Width (m)	Area (m^2)
Horse Creek Bridge	50 yds. above bridge	48	8.8	422
Horse Creek #2	150 yds. above bridge	19.8	10.9	216
Chamberlain Cr. #1	400 yds. above mouth	24	5.9	142
Chamberlain Cr. #2	500 yds. above mouth	23	8.0	184
Bargamin Cr. 11	1/4 mile above mouth	25	9.9	248
Bargamin Cr. #2	at Trail Flat above #1	37	10.9	403
Sheep Cr. #1	Pack bridge downstream	35.7	7.2	257
Sheep Cr. #2	300 yds. above pack bridge	12.2	7.5	92
Pahsimeroi R. Dowton Lane	run above, plus pool below Dowton Bridge	30	11.6	347
Pahsimeroi R. Lower	200 yd. below Dowton Bridge	19	6.6	125

Appendix E. Number of cutthroat trout counted in comparable transacts for 1971, 1978, 1984 and 1986 by length (mm) classes.

	197			1978			1984			198		
Transact	<152	152—305	>305	<152	152⁻305	>305	<152	152 305	>305	<152	152 305	>305
Pungo	0	4	0	3	10	17	2	11	6	4	7	14
Marble	0	3	0	0	51	10	28	46	40	1	25	41
Lower Jackass	0	12	2	0	21	7	0	17	9	0	2	0
Whitey Cox	0	5	0	0	27	9	0	21	5	13	9	3
Hospital Bar	0	5	11	0	12	6	2	15	8	25	12	4
Tappan Pool	0	7	4	0	19	5	0	13	4	2	10	1
Flying B	0	2	0	0	5	3	0	3	4	7	7	6
Big Creek	0	4	0	2	9	1	0	10	2	4	6	3
Ship Island	0	3	0	0	22	13	0	21	1	6	12	2
Otter Bar	0	14	0	0	18	14	0	26	9	5	5	2
Goat Creek	0	17	0	0	25	10	0	13	11	3	5	2
Totals	0	76	17	5	219	95	32	196	99	70	100	78
Percent	0	82	18	2	67	30	10	60	30	28	40	31
Annual totals		93			319			327			248	

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